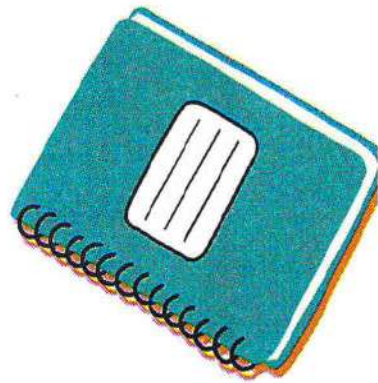
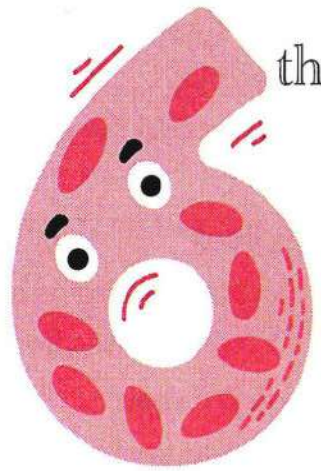
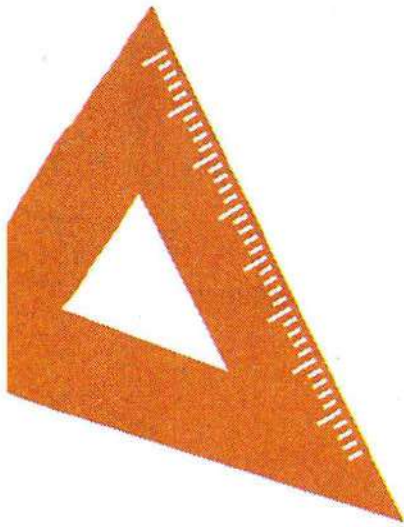




سلسلة كتب الأستاذ

Math

Main Book



Primary

First Term

Mohamed Nasreldin



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Guide Answers

Theme

1

Number Sense and Operations (Expressions and Equations)

Theme Units 

Unit

1

Division, Factors, and Multiples

Concept 1.1: Division Algorithm, GCF,
and LCM

Unit

2

Rational Numbers

Concept 2.1: Explore the Number Line

Concept 2.2: Investigate Rational
Numbers

Concept 2.3: Interpret and Use
Absolute Value

Unit

3

Algebraic Expressions

Concept 3.1: Use and Analyze
Expressions

Concept 3.2: Algebraic Expressions
and Exponents

Unit

4

Equations and Inequalities

Concept 4.1: Write and Solve Equations
and Inequalities

Unit

1

Division, Factors, and Multiples

Concept 1.1

Division Algorithm, GCF, and LCM

Lesson

1

Using Long Division in the Real World

Learning Objective:

By the end of this lesson, the student will be able to:

- Deduce divisibility by 2, 3, 4, 5, 6, and 10.

Lesson

2

Factorizing a Number to Its Prime Factors

Learning Objective:

By the end of this lesson, the student will be able to:

- Decompose a number into prime factors to find the greatest common factor and the least common multiple.

Lesson

3

Writing Expressions Using the GCF

Learning Objectives:

By the end of this lesson, the student will be able to:

- Write mathematical expressions that contain the greatest common factor.
- Imagine how a numerical expression that represents two whole numbers as a multiple of a sum of two whole numbers can represent a real-world situation.

Lesson

4

Analyzing Least Common Multiples

Learning Objectives:

By the end of this lesson, the student will be able to:

- Analyze the operations of adding and subtracting fractions and find the product of these operations.
- Use the least common multiple to form a common denominator.

1 Lesson

Using Long Division in the Real World

Remember

- The odd numbers are: 1 , 3 , 5 , 7 , 9 , 11 ,
- The even numbers are: 0 , 2 , 4 , 6 , 8 , 10 , 12 ,

Divisibility

$15 \div 3 = 5 \text{ R } 0$ So, 15 is divisible by 3

$15 \div 2 = 7 \text{ R } 1$ So, 15 is not divisible by 2

Any number is divisible by another if the remainder of the division operation is zero.

Practice 1 Complete the following table:

	Division	Quotient	Remainder	Divisible/ Not Divisible
<i>Example:</i>	$45 \div 5$	9	0	45 is divisible by 5
<i>Example:</i>	$25 \div 4$	6	1	25 is not divisible by 4
a	$60 \div 7$	.....	.....	60 is by 7
b	$35 \div 4$	.....	.....	35 is by 4
c	$28 \div 7$	.....	.....	28 is by 7
d	$120 \div 4$	.....	.....	120 is by 4
e	$29 \div 5$	.....	.....	29 is by 5
f	$18 \div 6$	.....	.....	18 is by 6

Determining Divisibility Without Performing Division

• Divisibility by 2

- A number is divisible by 2 if:

Its Ones digit is (0 , 2 , 4 , 6 , or 8) "an even number".

Examples: 78 , 292 , 1,654 are divisible by 2.

Even Numbers

• Divisibility by 3

- A number is divisible by 3 if:

The sum of its digits is divisible by 3 without a remainder. In other words, the sum of the digits is a multiple of 3, such as 0 , 3 , 6 , 9 , and so on.

Example: The number 582 is divisible by 3:

because

 $5 + 8 + 2 = 15$, and 15 is a multiple of 3.

• Divisibility by 4

- A number is divisible by 4 if:

The Ones and Tens digits of the number are divisible by 4 , or if the number ends with '00'.

In other words, its Ones and Tens digits should be multiples of 4 , such as 0 , 4 , 8 , 16 , etc.

Examples: • 5,124 is divisible by 4 because 24 is divisible by 4.

• 300 is divisible by 4 because its Ones and Tens digits are '00'.

• Divisibility by 5

- A number is divisible by 5 if:

Its Ones digit is either 0 or 5.

Examples: • 870 is divisible by 5 because its Ones digit is 0.

• 2,635 is divisible by 5 because its Ones digit is 5.

Divisibility by 10

- A number is divisible by 10 if:
Its Ones digit is 0.

Examples: 360 and 2,130 are divisible by 10
because their Ones digit is 0.

Divisibility by 6

- A number is divisible by 6 if it is divisible by both 2 and 3.
or the number whose Ones digit is even and the sum of its digits is divisible by 3 is divisible by 6.

Example: • 102 is divisible by 6:

because its Ones digit is 2, which is even, and the sum of its digits ($1 + 0 + 2$) is divisible by 3.

• 375 is not divisible by 6:

because its Ones digit is odd (not divisible by 2) and the sum of its digits ($3 + 7 + 5 = 15$) is divisible by 3.

Practice 2 Circle the numbers that are divisible by 2:

30	65	97	54	258
45	212	127	641	654
26	151	368	6,530	4,261

Practice 3 Circle the numbers that are divisible by 3:

45	36	28	456	2,005
154	368	554	1,002	12,748
558	652	100	58	10,002

Practice 4 Circle the numbers that are divisible by 5:

45	36	250	156	558
154	830	945	630	354
101	2,005	12,748	55,551	2,003

Practice 5 Use the following numbers to complete:

335 342 531 250 315 702 600

- a The numbers that are divisible by 2: _____
- b The numbers that are divisible by 3: _____
- c The numbers that are divisible by 5: _____
- d The numbers that are divisible by 6: _____
- e The numbers that are divisible by 10: _____

Practice 6 Complete the following table using (✓) or (✗):

Number		Divisible by...					
		2	3	4	5	6	10
Example:	45	✗	✓	✗	✓	✗	✗
a	32						
b	24						
c	30						
d	126						
e	130						
f	120						
g	456						

NOTES

The relationship between divisibility and (factors & multiples):

Example: The factors of 12 are 1, 2, 3, 4, 6, and 12.

So, the number 12 is divisible by any of these factors.

Example: The multiples of 5 are 0, 5, 10, 15, 20,

So, any of these multiples are divisible by 5.

Therefore, factors and multiples can be used to determine numbers that are divisible without a remainder.

Example: 25 is divisible by 5 because:

25 is a multiple of 5 **or** 5 is a factor of 25.

Quiz?

10

1 Choose the correct answer:

- a is divisible by 3. (2,134 **or** 1,026 **or** 146 **or** 37)
- b is divisible by 10. (1,024 **or** 2,009 **or** 6,900 **or** 105)
- c is divisible by 4. (54,653 **or** 7,593 **or** 836 **or** 4414)

2 Complete the following:

- a Any number is divisible by itself, except
- b Any number is divisible by 5 if its Ones digit is or
- c The smallest number that is divisible by 2 and 3 is
- d The smallest 2-digit number that is divisible by 4 is
- e Write down three numbers that are divisible by both 3 and 5 (common multiples):,, and

2

Lesson

Factorizing a Number to Its Prime Factors

Remember

The prime number: is a number greater than one and has only two factors, one and the number itself.

- All prime numbers are **odd**, except **2**.
- The **smallest** prime number is **2**.
- The only **even** prime number is **2**.
- The **smallest odd** prime number is **3**.
- **1** is neither a prime number nor a composite number.
- Prime numbers less than 100 are:

The prime numbers between			The prime numbers between		
0	2, 3, 5, 7	10	50	53, 59	60
10	11, 13, 17, 19	20	60	61, 67	70
20	23, 29	30	70	71, 73, 79	80
30	31, 37	40	80	83, 89	90
40	41, 43, 47	50	90	97	100

- Any number is a factor and a multiple of **itself**, except **zero**.

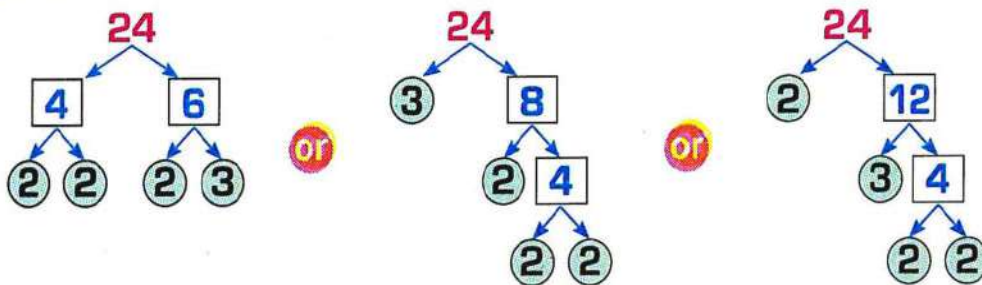
Prime Factorization

It means writing the composite number as the product of prime numbers.

Example: Factorize 24 into its prime factors:

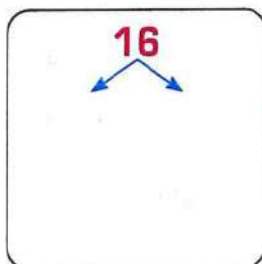
- 1 Choose two numbers whose **product** is 24 (1 should not be used).
- 2 Circle the **prime numbers** and leave them, then continue factorizing the composite numbers.
- 3 Stop when all numbers become **prime numbers**.

Note that: All the following are true, and we get the same result: $24 = 2 \times 2 \times 2 \times 3$



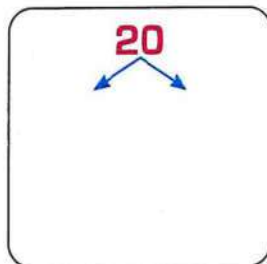
Practice 1 Factorize each number into its **prime factors** using the **factors tree**:

a 16



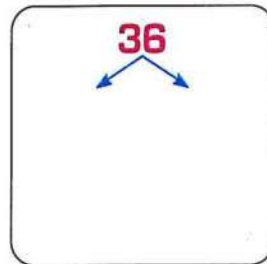
16 = _____

b 20



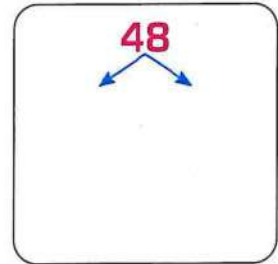
20 = _____

c 36



36 = _____

d 48

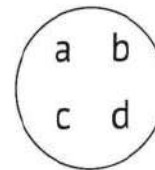
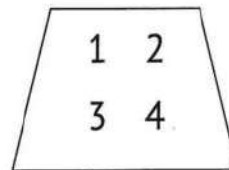
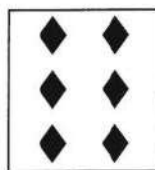


48 = _____

Venn Diagram

It is a closed shape that contains elements (things) in it.

Examples:

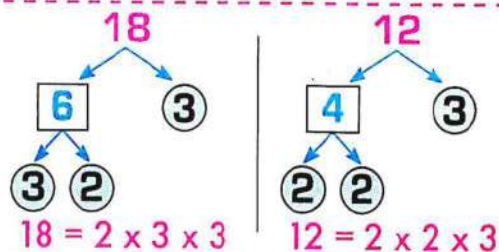


Finding the GCF and LCM Using a Venn Diagram

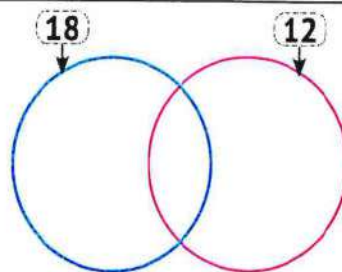
We can find the GCF and LCM of two numbers using a Venn diagram by following these steps:

Example: Find the GCF and LCM of **18** and **12** using a Venn diagram:

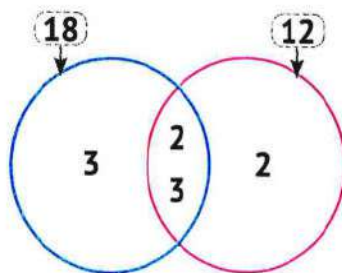
- 1** Factorize the two numbers into their prime factors using the factors tree.



- 2** Draw two intersecting circles, each circle contains the prime factors of one of the two numbers.

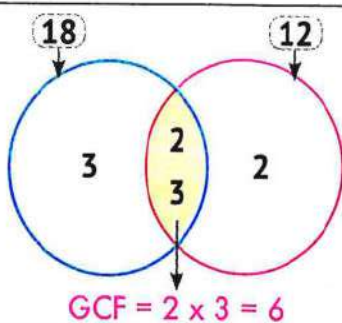


- 3** Place the prime factors for each number in its circle so that the common prime factors of the two numbers are in the common part between the two circles.



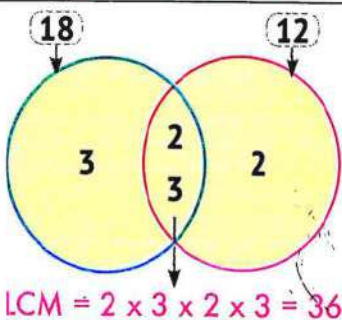
- 4** The **greatest common factor** of the two numbers is the product of factors presented in the common part between the two circles.

$$\text{GCF} = 2 \times 3 = 6$$



- 5** The **least common multiple** of the two numbers is the product of all the factors in the two circles.

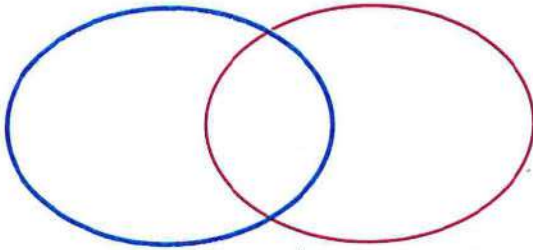
$$\text{LCM} = 2 \times 3 \times 2 \times 3 = 36$$



Practice 2

Find the **GCF** and **LCM** of the following numbers:

a 16 and 20



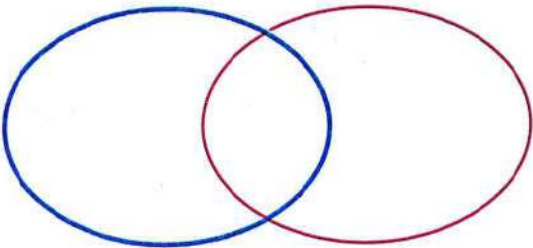
- GCF = _____
- LCM = _____

16

20

- 16 = _____
- 20 = _____

b 24 and 36



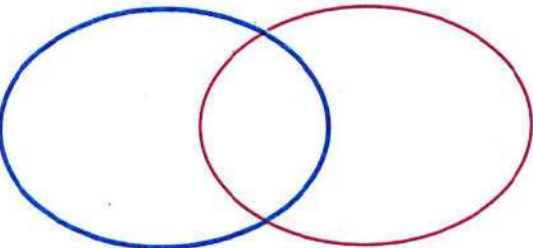
- GCF = _____
- LCM = _____

24

36

- 24 = _____
- 36 = _____

c 16 and 15



- GCF = _____
- LCM = _____

16

15

- 16 = _____
- 15 = _____

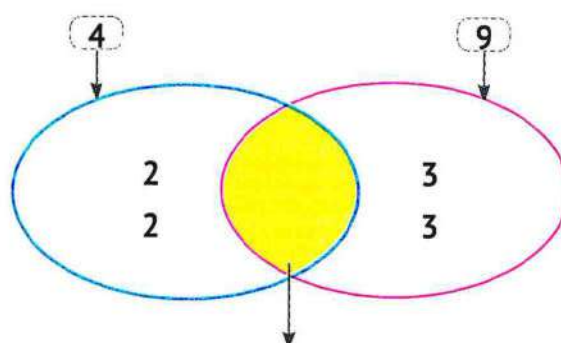
Relatively Prime Numbers

They are numbers whose only common factor is 1.

So, they are prime numbers with respect to each other.

For example: 4 and 9 are composite numbers.

$$4 = 2 \times 2 \quad , \quad 9 = 3 \times 3$$



When there is no prime factors
in the common part, then

$$\text{GCF} = 1$$

- The greatest common factor of 4 and 9 is 1.
- Therefore, 4 is a prime number with respect to 9.
- 9 is a prime number with respect to 4.
- 4 and 9 are relatively prime numbers.

NOTE

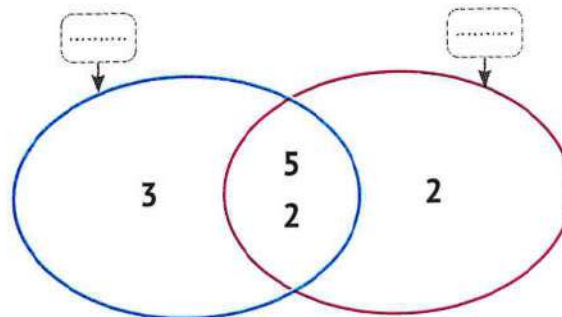
- The lowest common multiple of the relatively prime numbers is **their product**.

For example: The common multiple of 4 and 9 is $4 \times 9 = 36$.

Practice 3 Complete the following table:

Numbers		Prime Factors	GCF	LCM	Relatively Prime Numbers (Yes or No?)
<i>Example:</i> 12 and 15		$12 = 2 \times 2 \times 3$ $15 = 3 \times 5$	3	$2 \times 2 \times 3 \times 5$ $= 60$	No
a	9 and 8	$9 = \dots\dots\dots$ $8 = \dots\dots\dots$			
b	15 and 4	$15 = \dots\dots\dots$ $4 = \dots\dots\dots$			
c	6 and 8	$6 = \dots\dots\dots$ $8 = \dots\dots\dots$			

4 Using the following Venn diagram, complete:



- The **two** numbers represented in the Venn diagram are and
- The **common prime factors** of the two numbers are
- The **GCF** of the two numbers is
- The **LCM** of the two numbers is
- Are the two numbers **relatively prime numbers**?

(Yes or No?)

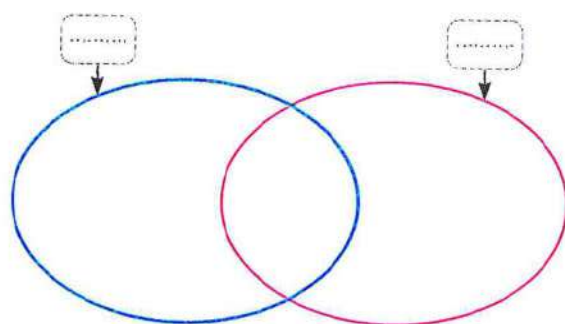


1 Complete the following:

- a The **prime** number has only factor(s).
- b The **LCM** of the two relatively prime numbers is
- c Two numbers are relatively prime numbers if their **GCF** is

2 Answer the following:

- a Find the **GCF** and **LCM** of 16 and 24 using the following Venn diagram:



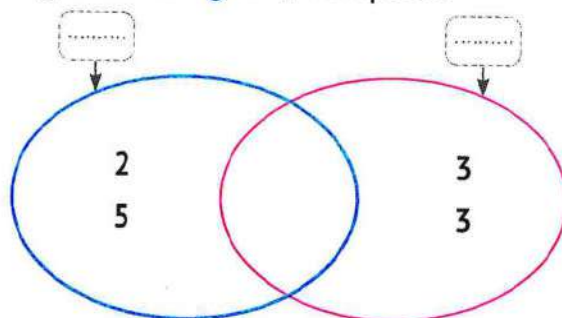
- GCF =
- LCM =

16

24

- 16 =
- 24 =

- b Using the following **Venn diagram**, complete:



- 1 The two numbers represented in the Venn diagram are and
- 2 The **common prime factors** of the two numbers are
- 3 The **GCF** of the two numbers is
- 4 The **LCM** of the two numbers is
- 5 Are the two numbers **relatively prime numbers**?

(Yes or No?)

3 Lesson

Writing Expressions Using the GCF

Remember

- The **Distributive Property** states that multiplying a number by the sum of two addends is the same as multiplying that number by each addend individually and then adding those products.

Example:

$$7 \times (3 + 9) = (7 \times 3) + (7 \times 9)$$

Practice 1 Complete the following:

- $5 \times (3 + 6) = (\dots \times \dots) + (\dots \times \dots)$
- $\dots \times (\dots + \dots) = (7 \times 2) + (7 \times 4)$
- $8 \times (\dots + \dots) = (\dots \times 9) + (\dots \times 2)$
- $\dots \times (4 + 6) = (9 \times \dots) + (9 \times \dots)$

Writing Numerical Expressions Using the Greatest Common Factor

- The greatest common factor is used to solve real-world problems that usually involve

Dividing

Breaking

Cutting things into pieces

Separating things into groups

Distributing Equally

- Numerical expressions can be written to express real-world problems using the Distributive Property.

Example: A student collected 12 bags of legumes and 8 boxes of cheese to prepare cartons of donations for the poor. Write a numerical expression that represents the largest number of cartons possible so that all cartons include the same number of the two types of food.

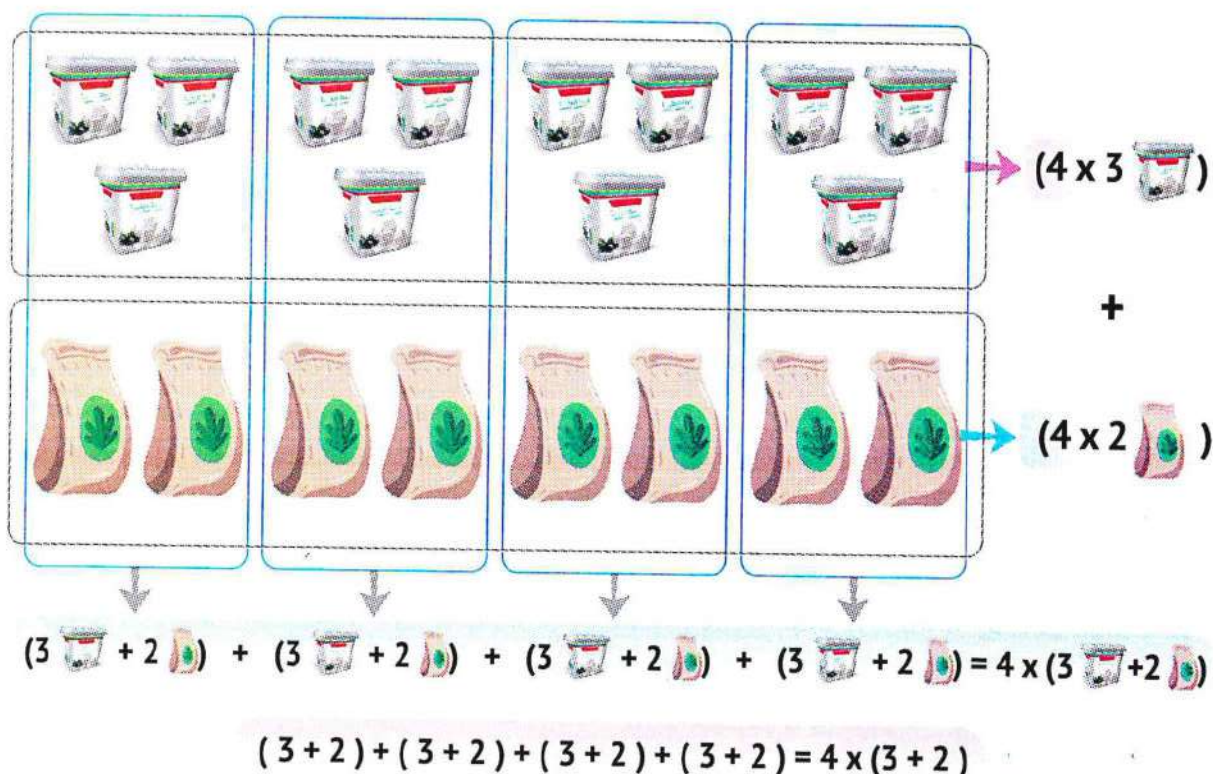
Answer To find the largest number of cartons, the greatest common factor of 12 and 8 must be found.

$$\begin{array}{rcl} 12 & = & 2 \times 2 \times 3 \\ 8 & = & 2 \times 2 \times 2 \\ \hline \text{GCF} & = & 2 \times 2 = 4 \end{array}$$

This means that:

- The largest number of cartons (GCF) is 4 cartons.
- The number of bags of legumes in each carton is $12 \div 4 = 3$ bags.
- The number of cheese boxes in each carton is $8 \div 4 = 2$ boxes.

The following figure represents the cartons,



So, $(4 \times 3) + (4 \times 2) = 4 \times (3 + 2)$

Practice 2

Malak cooked 30 dishes of Umm Ali and 48 pieces of baklava for her family. She wants to divide the desserts into boxes so that each person gets the same number of the two desserts. Write a numerical expression representing the largest number of boxes that she can prepare.

$$30 = \underline{\hspace{2cm}}$$

$$48 = \underline{\hspace{2cm}}$$

$$\text{GCF} = \underline{\hspace{2cm}}$$

30

48

- The largest number of boxes (GCF) is _____
- The number of Umm Ali dishes in each box: _____
- The number of baklava pieces in each box: _____
- The numerical expression: _____

Practice 3

Ahmed wants to grow 24 jasmine plants and 16 phil plants in his garden. Ahmed wants to plant these plants in basins so that each basin contains the same number of the two types of plants. Write a numerical expression that represents the largest number of basins he can plant.

=

=

=

24

16

The numerical expression: _____



1 Complete the following:

- a $5 \times (7 + 2) = (5 \times \dots) + (\dots \times 2)$
- b $2 \times (\dots + \dots) = (\dots \times 4) + (\dots \times 6)$
- c The **GCF** of **9** and **6** is $\dots$
- d The **GCF** of all numbers is $\dots$
- e $5 \times (\dots + \dots) = 30 + 40$

2 Answer the following:

- a Sama has **12** red pens and **15** blue pens. What is the greatest number of equal groups she can make so that each group has the same number of red pens and the same number of blue pens?

$\dots = \dots$

$\dots = \dots$

$\dots = \dots$

- b Marwa divided **12** oranges and **8** candies into bags so that the bags contained the same number of oranges and the same number of candies. Write a numerical expression for this situation.

$\dots$

$\dots$

$\dots$

$\dots$

4 Lesson

Analyzing Least Common Multiples

Remember

For Adding and Subtracting Fractions with Unlike Denominators By Using the LCM

Solution steps:

- 1 Find the **LCM** of the denominators.
- 2 Replace these fractions with **equivalent fractions** with a like denominator.
- 3 **Add** or **subtract**, then put the answer in its simplest form if possible.

For example: a **Add:** $3\frac{3}{8} + 9\frac{1}{6}$

Note that:

1 The LCM of 8 and 6 is 24.

2 $3\frac{3}{8} = 3\frac{9}{24}$, $9\frac{1}{6} = 9\frac{4}{24}$

3 $3\frac{3}{8} + 9\frac{1}{6} = 3\frac{9}{24} + 9\frac{4}{24} = 12\frac{13}{24}$

b **Subtract:** $9\frac{4}{9} - 6\frac{1}{3}$

Note that:

1 The LCM of 9 and 3 is 9.

2 $9\frac{4}{9} = 9\frac{4}{9}$, $6\frac{1}{3} = 6\frac{3}{9}$

3 $9\frac{4}{9} - 6\frac{1}{3} = 9\frac{4}{9} - 6\frac{3}{9} = 3\frac{1}{9}$

Practice 1 Find the result in the simplest form:

a $\frac{3}{4} + \frac{5}{12} = \dots + \dots = \dots$

b $\frac{7}{9} - \frac{1}{3} = \dots - \dots = \dots$

c $2\frac{3}{8} + 1\frac{5}{6} = \dots + \dots = \dots$

d $5\frac{8}{9} - 3\frac{1}{2} = \dots - \dots = \dots$

e $8\frac{1}{5} + 2\frac{1}{3} = \dots + \dots = \dots$

f $6\frac{2}{3} - 2\frac{1}{4} = \dots - \dots = \dots$

Analyzing the Least Common Multiple

Example: Ola made 4 trays of basbousa, all the same size, and cut each tray differently. After the party, she noticed that some basbousa was left over in each tray, as follows:

$\frac{1}{3}$ of the first tray, $\frac{1}{6}$ of the second tray, $\frac{5}{12}$ of the third tray, $\frac{1}{4}$ of the last tray.

What is the total amount of basbousa left?

$$\frac{1}{3} + \frac{1}{6} + \frac{5}{12} + \frac{1}{4} = \frac{4}{12} + \frac{2}{12} + \frac{5}{12} + \frac{3}{12} = \frac{14}{12} = 1\frac{2}{12} = 1\frac{1}{6} \text{ trays}$$

Practice 2 Answer the following:

- a Maher spent $2\frac{3}{4}$ hours studying Arabic, $1\frac{1}{2}$ hours studying mathematics, and $1\frac{1}{5}$ hours studying science.

How many hours did Maher spend studying all subjects?

- b Galal bought a pen for $5\frac{1}{2}$ pounds, a ruler for $3\frac{3}{4}$ pounds, and an eraser for 2 pounds. How much money did Galal pay to buy these supplies?
- c Karim had $25\frac{1}{2}$ pounds, and he bought a booklet for $16\frac{1}{4}$ pounds. How much money is left with Karim?
- d Ahmed runs for $4\frac{1}{2}$ hours a day, and Heba runs for $3\frac{1}{4}$ hours a day. What is the difference between the time they both run?

Quiz?

10

1 Complete the following:

a $5\frac{1}{6} + 3\frac{1}{3} =$

b $9\frac{1}{2} - 2\frac{1}{4} =$

c $7\frac{3}{4} - \dots = 3\frac{2}{5}$

d $\dots - 3\frac{4}{5} = 7\frac{1}{3}$

2 Answer the following:

- a Attia bought $3\frac{1}{2}$ kg of oranges and $4\frac{1}{4}$ kg of bananas. What is the total mass of fruit that Attia bought?

- b Hana had 12 meters of fabric, of which she used $3\frac{1}{2}$ meters to make a dress. How many meters of fabric does she have left?

Unit

2

Rational Numbers

Concept 2.1

Explore the Number Line

Lessons

1&2

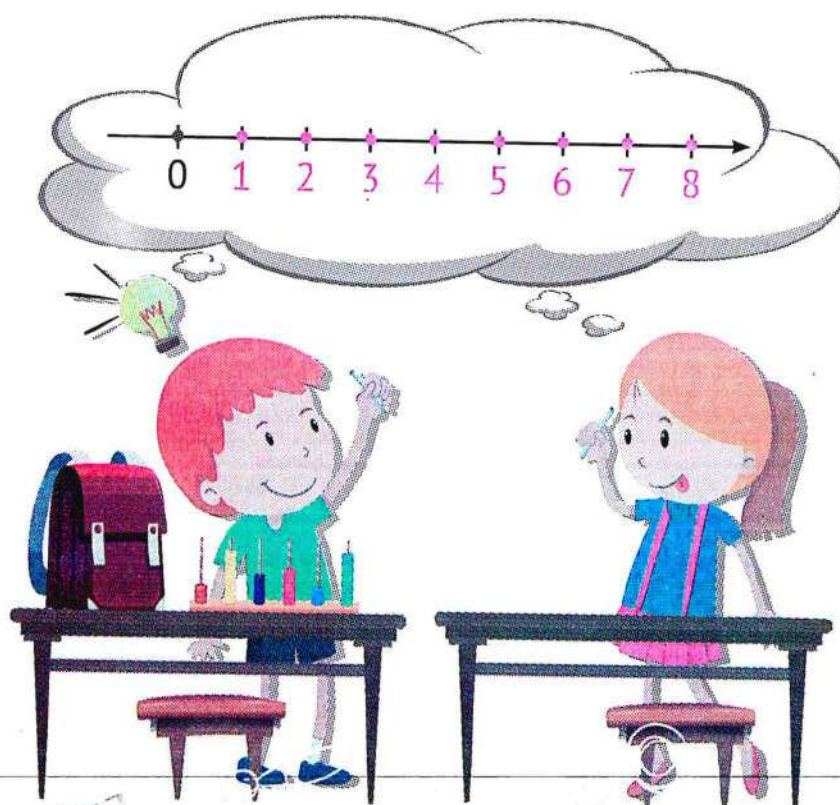
Using a Number Line to Describe Data

Using a Number Line and Symbols to Compare Numbers

Learning Objectives:

By the end of these lessons, the student will be able to:

- Recognize the number line to include negative numbers in order to utilize them to model real-world situations.
- Plot positive and negative points on a number line and discuss relative positions.
- Discuss the relative positions by plotting positive and negative points on a number line.
- Discover opposites of numbers.



1&2 Lessons

Using a Number Line to Describe Data Using a Number Line and Symbols to Compare Numbers

Sets of Numbers

- You have studied some sets of numbers, as follows:

The Set of Counting Numbers: 1, 2, 3, 4, 5, 6, 7,

The Set of Odd Numbers: 1, 3, 5, 7, 9, 11, 13,

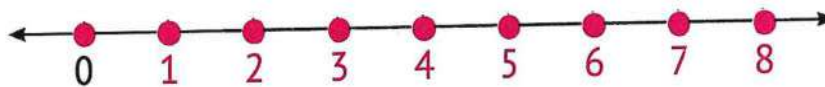
The Set of Even Numbers: 0, 2, 4, 6, 8, 10, 12,

Now you will study:

The Set of Natural Numbers:

- They are a set of counting numbers in addition to zero.

0, 1, 2, 3, 4, 5, 6, 7,



The Set of Integers:

- They are numbers that do not contain decimals or fractional parts.

Integers

Negative Numbers

They are numbers less than zero, preceded by a (-) sign.

Zero

"0" is neither positive nor negative.

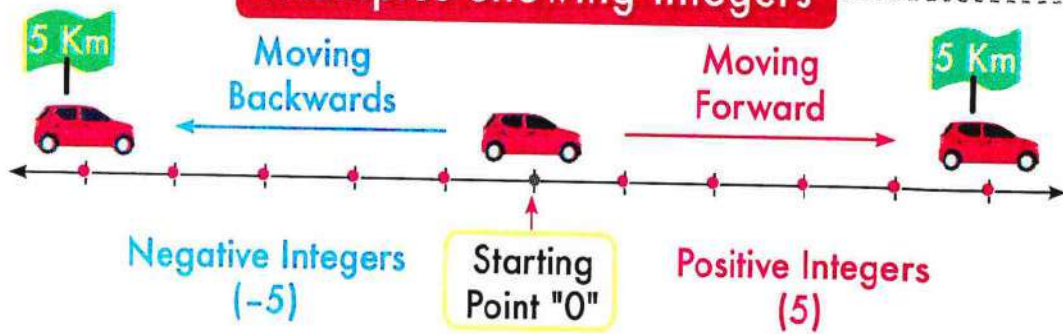
Positive Numbers

They are numbers greater than zero and are written without a sign.

Examples: -5, -58, -212, ...

Examples: 25, 2, 157, ...

Examples Showing Integers



- When starting from "0", moving forward represents positive integers, and moving backward represents negative integers.

Temperatures

Minus 6°C
(-6°C)



31°C



- Temperatures above zero represent positive integers, and temperatures below zero represent negative integers.

Sea Level

- The places above the sea level represent positive numbers.

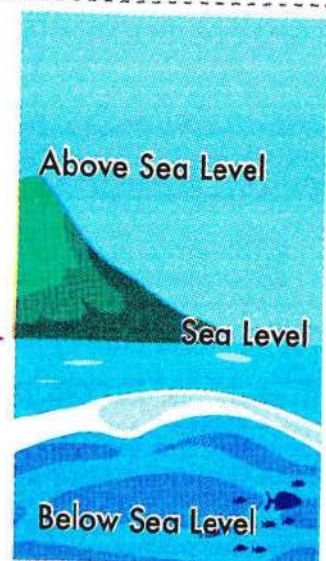
Positive Integers

- The sea surface represents the number "0".

0

- The places below the sea level represent negative numbers.

Negative Integers



Keywords

Negative

- To the left
- Backward
- Down
- Loss
- Below sea level
- Sub zero
- Withdraw
- Deep

Positive

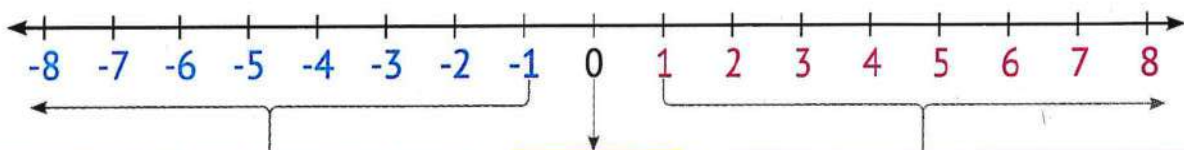
- To the right
- Foreword
- Up
- Profit/Gain
- Above sea level
- Over zero
- Deposit
- High

Practice 1 Write an **integer** to represent each of the following situations:

- The value of the profit is 25 Egyptian pounds. (.....)
- The value of the loss is 3 pounds. (.....)
- The temperature is 10 degrees below zero. (.....)
- The building's height is 12 meters. (.....)
- The drop is 19 meters underground. (.....)
- Move 4 steps back. (.....)

Representing Integers on a Number Line

- Each integer can be represented by only one point on the number line such that the consecutive numbers at equal distances, as follows:



Negative numbers
(numbers less than zero)
are written to the **left** of zero.

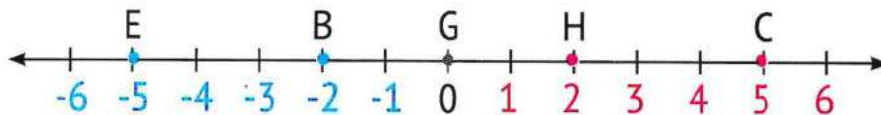
Zero "0"

Positive numbers
(numbers greater than zero)
are written to the **right** of zero.

- Positive integers are: 1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , ...
- Negative integers are: -1 , -2 , -3 , -4 , -5 , -6 , -7 , -8 , ...

Integers extend without ending to the left and right of zero.

Example: Write the numbers indicated by the symbols shown on each of the horizontal and vertical number lines:



A → -4

D → 1

G → 0

B → -2

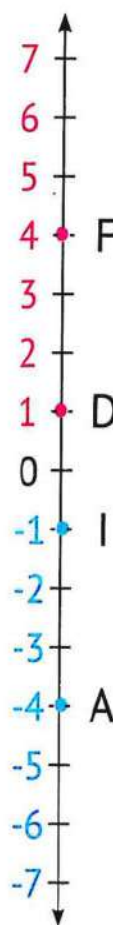
E → -5

H → 2

C → 5

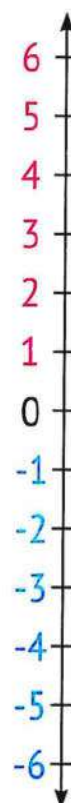
F → 4

I → -1



Practice 2 The following table shows the **temperatures** at which some liquids freeze. Determine these temperatures on the number line shown.

Liquids	Freezing Point (In Celsius)
a Olive oil	-5
b Fresh water	0
c Sea water	-2
d Peanut oil	3
e Orange juice	-6

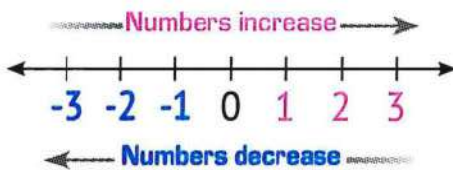


Comparing Integers Using a Number Line

- A number line can be used to compare integers for any two different numbers.

Horizontal Number Line

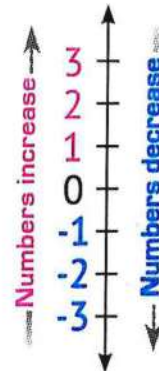
The **greater** number is to the right of the other number.



The **smaller** number is to the left of the other number.

Vertical Number Line

The **greater** number is above the other number.

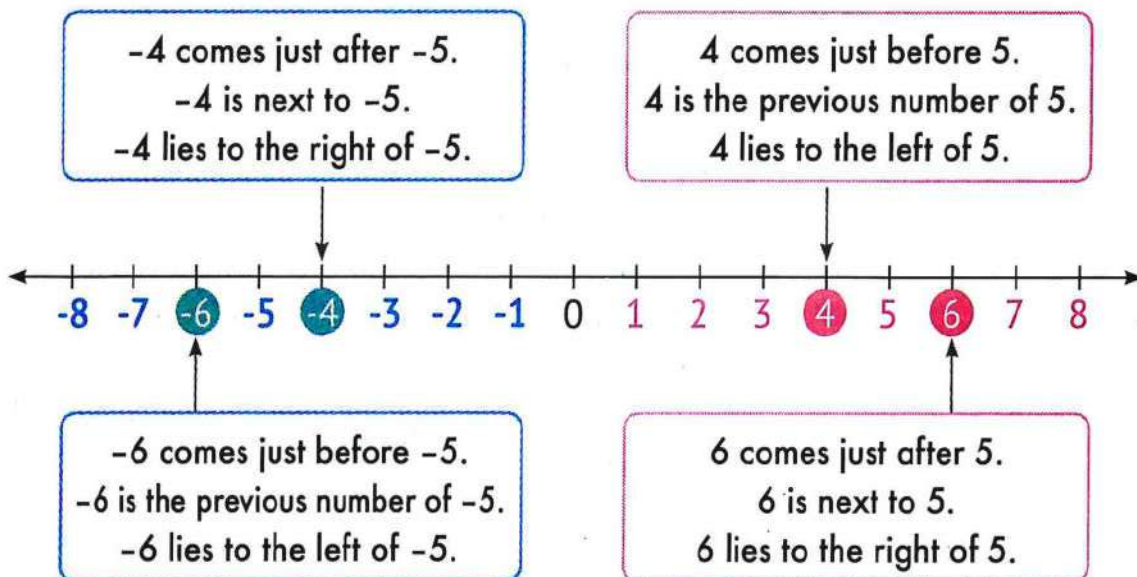


The **smaller** number is below the other number.

So that $\dots < -5 < -4 < -3 < -2 < -1 < 0 < 1 < 2 < 3 < 4 < 5 < \dots$

Examples:

Using the following number line:



Practice 3 Complete the following:

- a comes just after -3 . b 6 comes just after
- c -7 is next to d is next to 7.
- e comes just before -9 . f 0 comes just before
- g -2 is the previous number of
- h -1 is the previous number of

NOTES

- The numbers **increase** from left to right and from bottom to top.
- The numbers **decrease** from right to left and from top to bottom.
- Any positive number is **greater than** any negative number.
- Zero is **less than** any positive number and **greater than** any negative number.

Negative Integers < 0 < Positive Integers

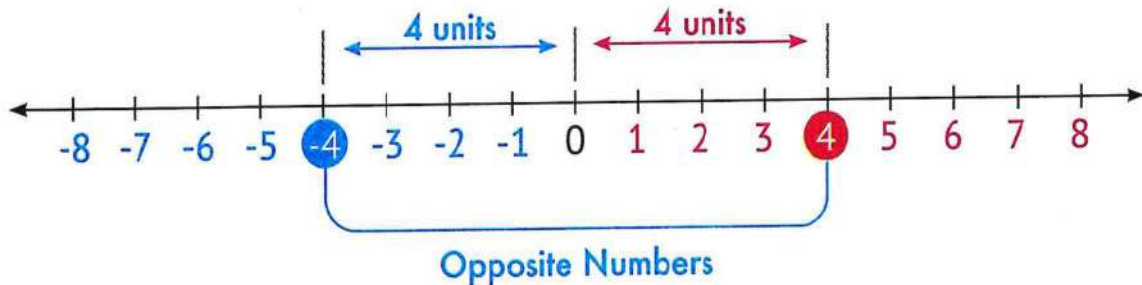
- The **smallest positive number** is 1, and the **greatest positive number** cannot be specified.
- The **greatest negative number** is -1 , and the **smallest negative number** cannot be specified.
- Zero is the **smallest** non-negative number and the **greatest** non-positive number.

Practice 4 Compare using (<, =, or >):

- | | | | | | | | | | | | |
|---|---|----------------------|-------|---|------|----------------------|------|---|------|----------------------|---|
| a | 3 | <input type="text"/> | 9 | b | -5 | <input type="text"/> | -7 | c | -6 | <input type="text"/> | 5 |
| d | 9 | <input type="text"/> | -4 | e | 3 | <input type="text"/> | -3 | f | 9 | <input type="text"/> | 0 |
| g | 0 | <input type="text"/> | -10 | h | -6 | <input type="text"/> | -6 | i | 7 | <input type="text"/> | 7 |

Opposite Numbers (Additive Inverse)

- On the number line, any two numbers that are the same distance from 0 but on opposite sides are called **opposite numbers** (additive inverse).



The opposite of 4 is -4 , **and** the opposite of -4 is 4.

So, 4 and -4 are **opposite numbers**.

4 and -4 are the additive inverse of each other.

Practice 5 Write the **opposite** of each of the following numbers:

a -7 $\longrightarrow$

b 6 $\longrightarrow$

c -15 $\longrightarrow$

d 12 $\longrightarrow$

e 0 $\longrightarrow$

f -45 $\longrightarrow$



1 Complete the following:

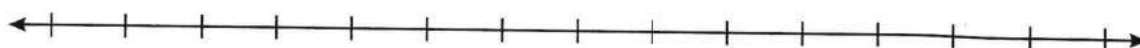
- a The greatest non-positive integer is
- b A temperature that is 4°C below zero is written as ".....".
- c The opposite of -3 is

2 Choose the correct answer:

- a $-4 > \dots\dots\dots$ (2 or 0 or -3 or -7)
- b The integer that comes just before -3 is
(-4 or 4 or -2 or 2)
- c -25 12 ($>$ or $=$ or $<$)

3 Represent the following numbers on the number line, then arrange them in an **ascending** order:

3 , -6 , -3 , 0 , 6



The order:

Unit

2

Rational Numbers

Concept 2.2

Investigate Rational Numbers

Lessons

3&4

Analyzing Rational Numbers by Using Models Comparing and Ordering Rational Numbers

Learning Objectives:

By the end of these lessons, the student will be able to:

- Utilize the visual of a Venn diagram to help students conceptualize the number system.
- Investigate the symmetry of the number line and the use of opposites through a real-world context of tug-of-war.
- Practice representing real-world situations as rational numbers, and then order the values from least to greatest.



3&4 Lessons

Analyzing Rational Numbers by Using Models Comparing and Ordering Rational Numbers

The Set of Rational Numbers:

- **Rational numbers** are all numbers that can be put in the form $\frac{a}{b}$.
- Where "**a**" is an integer, and "**b**" is an integer that is not equal to zero.

All fractions and mixed numbers are rational numbers.

Examples: $\frac{3}{4}$, $\frac{5}{8}$, $3\frac{2}{5} = \frac{17}{5}$, $3\frac{1}{4} = \frac{13}{4}$

All decimals are rational numbers:

- Where they can be put in the form of a normal fraction $\frac{a}{b}$.

Examples: $0.8 = \frac{8}{10}$, $0.23 = \frac{23}{100}$, $2.5 = \frac{25}{10}$, $24.08 = \frac{2,408}{100}$

All integers are rational numbers.

- Where they can be put in the form of a normal fraction $\frac{a}{b}$.

Examples: $3 = \frac{3}{1}$, $-5 = -\frac{15}{3}$, $-12 = -\frac{12}{1}$, $8 = \frac{32}{4}$, $0 = \frac{0}{1}$

Practice 1

Write the following rational numbers in fraction form $\frac{a}{b}$:

a 0.75:

b -45:

c 4:

d 0:

e $3\frac{1}{5}$:

f -1.5:

Practice 2

Write "**belongs**" or "**does not belong**":

a $-\frac{3}{7}$: to the set of integers.

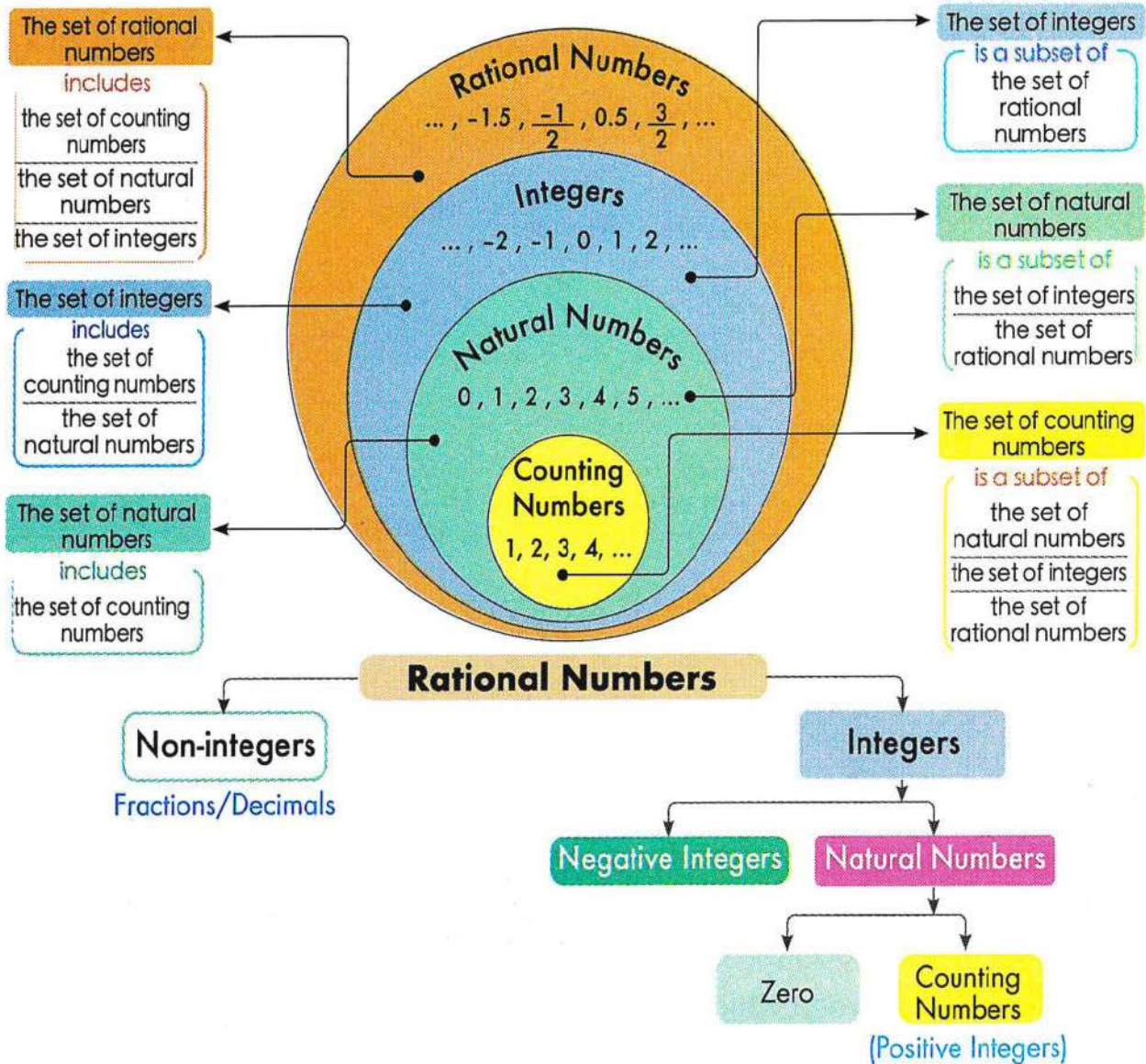
b 0 : to the set of natural numbers.

c -4 : to the set of counting numbers.

d 0 : to the set of rational numbers.

Inclusion and Subsets

- We can represent the previous sets of numbers in the following Venn form, and we can say that:



Practice 3 Write "a subset" or "not a subset":

- The set of integers is of the set of counting numbers.
- The set of natural numbers is of the set of integers.
- The set of counting numbers is of the set of rational numbers.
- The set of rational numbers is of the set of natural numbers.

NOTE

- The best subset is the smallest set that the number belongs to.

Practice 4 Classify the following numbers according to the number groups shown. Put a tick ✓:

	Number	Counting Numbers	Natural Numbers	Integers	Rational Numbers	Best Subset
<i>Example:</i>	-2	X	X	✓	✓	Integers
a	5					
b	0					
c	-7					
d	3.5					
e	$\frac{3}{4-4}$					
f	$-2\frac{1}{3}$					

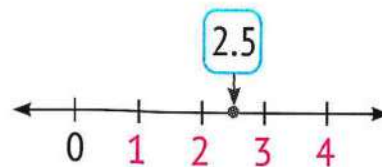
Representing Rational Numbers on a Number Line

- To determine the position of a rational number on a number line, find the **two integers** between which the fractions or decimals lie.

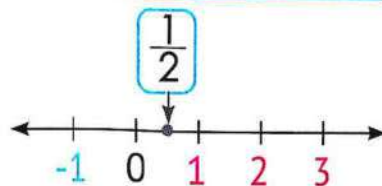
Example: Identify the following numbers on the number line:

$$(2.5, \frac{1}{2}, -5.5, 6\frac{3}{4})$$

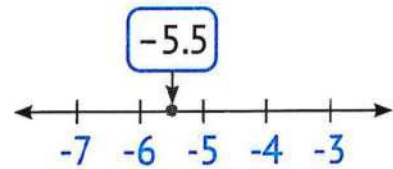
- 2.5 lies between the two integers 2 and 3.



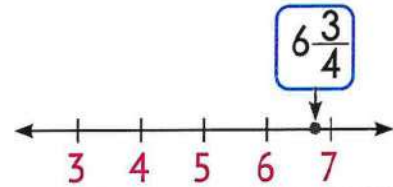
- $\frac{1}{2}$ lies between the two integers 0 and 1.



- -5.5 lies between the two integers -5 and -6 .

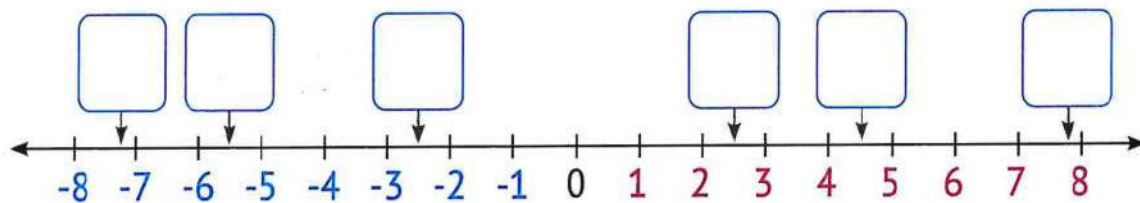


- $6\frac{3}{4}$ lies between the two integers 6 and 7.



Practice 5 Put the following numbers in the suitable places on the number line:

$$4\frac{1}{2}, 2.5, -2\frac{1}{3}, -7.25, -5.5, 7\frac{3}{4}$$



NOTES

We can determine the additive inverse of a rational number, **as**:

- The additive inverse of 6.3 is -6.3 ($-\frac{63}{10}$).
- The additive inverse of $-\frac{5}{8}$ is $\frac{5}{8}$.

Practice 6 Write the **opposite number** (the **additive inverse**) of each of the following rational numbers:

a $-0.8 \rightarrow$

b $-\frac{3}{4} \rightarrow$

c $2.5 \rightarrow$

d $0 \rightarrow$

e $0.6 \rightarrow$

f $3\frac{1}{7} \rightarrow$

Comparing Two Rational Numbers

First: If the two numbers have different signs:

- The positive number is always greater than the negative number.

For example: $0.5 > -\frac{15}{8}$, $-\frac{5}{8} < \frac{1}{8}$

Second: If the two numbers have the same sign:

1 Both numbers are positive:

a Like denominators

For example: $\frac{2}{7} < \frac{5}{7}$

b Unlike denominators

Use LCM for denominators

For example: $\frac{3}{5} > \frac{3}{7}$
 $\frac{21}{35} > \frac{15}{35}$

2 Both numbers are negative:

a Like denominators

For example: $-\frac{1}{7} > -\frac{2}{7}$

b Unlike denominators

Use LCM for denominators

For example: $-\frac{5}{6} < -\frac{3}{4}$
 $-\frac{10}{12} < -\frac{9}{12}$

Another Method

- If $\frac{a}{b}$ and $\frac{c}{d}$ are two rational numbers, then $\frac{a}{b} > \frac{c}{d}$ when $a \times d > c \times b$, where $b > 0$ and $d > 0$.

For example:

$$4 \times 5 = 20$$

$$3 \times 7 = 21$$

$$\frac{4}{7} < \frac{3}{5}$$

$$-(4 \times 5) = -20$$

$$-(3 \times 7) = -21$$

$$-\frac{4}{7} > -\frac{3}{5}$$

Practice 7

Compare using ($<$, $=$, or $>$):

a $-\frac{6}{7}$ $-\frac{3}{7}$

b $-\frac{13}{10}$ $\frac{1}{8}$

c $\frac{5}{12}$ $\frac{7}{12}$

d $-\frac{4}{7}$ $-\frac{1}{2}$

e $\frac{3}{5}$ $\frac{2}{3}$

f $-\frac{2}{3}$ $-\frac{2}{7}$

g 0.9 $\frac{9}{10}$

h $-3\frac{1}{4}$ 1

i $-\frac{1}{3}$ 0

NOTE

- To arrange rational numbers, we follow the same **comparison rules**.

Example: Arrange the following numbers from the smallest to the greatest:

a $2.1, 1.4, -3\frac{1}{4}, -1\frac{7}{8}, -2\frac{1}{2}$

The order: $-3\frac{1}{4}, -2\frac{1}{2}, -1\frac{7}{8}, 1.4, 2.1$

The numbers are arranged by looking at the integer parts in each number first.

b $-0.3, 0.7, -\frac{1}{2}, \frac{3}{4}, \frac{2}{5}$

$-0.3, 0.7, -\frac{1}{2}, \frac{3}{4}, \frac{2}{5}$

Put all the numbers in the rational number form $\frac{a}{b}$.

$\rightarrow -\frac{3}{10}, \frac{7}{10}, -\frac{1}{2}, \frac{3}{4}, \frac{2}{5}$

Find the common denominators if you need to.

$\rightarrow -\frac{3}{10}, \frac{14}{20}, -\frac{5}{10}, \frac{15}{20}, \frac{8}{20}$

Arrange the negative numbers, and then the positive numbers.

$\rightarrow -\frac{5}{10}, -\frac{3}{10}, \frac{8}{20}, \frac{14}{20}, \frac{15}{20}$

The order: $-\frac{1}{2}, -0.3, \frac{2}{5}, 0.7, \frac{3}{4}$

Practice 8

Arrange the following numbers:

a $3\frac{5}{9}, 5\frac{3}{8}, 0.6, -4, 2\frac{3}{7}$

① Ascending order:

② Descending order:

b 0.3 , -0.2 , $\frac{1}{4}$, $-\frac{1}{4}$, $\frac{1}{2}$

1 Ascending order:

2 Descending order:



10

1 Choose the correct answer:

a "-1.9" is a/an

(counting number or natural number or integer or rational number)

b The opposite of $-\frac{8}{9}$ is ($\frac{8}{9}$ or $-\frac{9}{8}$ or $\frac{9}{8}$ or $1\frac{1}{8}$)

c $\frac{2}{3}$ $-\frac{2}{3}$ ($>$ or $=$ or $<$)

d The rational number -5 lies between the two integers

(-4 and -5 or -3 and -4 or -4 and -6 or 5 and 6)

2 Complete the following:

a The additive inverse of 5.9 is

b is a negative integer more than -2 .

c All integers are numbers.

d The additive inverse of is itself.

3 Arrange the following numbers in a descending order:

$-3\frac{1}{5}$, $-7\frac{1}{2}$, -3.8 , -7 , 7.7

Unit

2

Rational Numbers

Concept 2.3

Interpret and Use Absolute Value

Lessons

5&6

Exploring Absolute Value Comparing Absolute Values

Learning Objectives:

By the end of these lessons, the student will be able to:

- Represent distance for real-world situations involving jumping fish and meeting friends at a fishpond.
- Understand absolute value on a number line.
- Compare absolute values using symbols.
- Interpret the use of absolute value through real-world situations involving money and temperature.

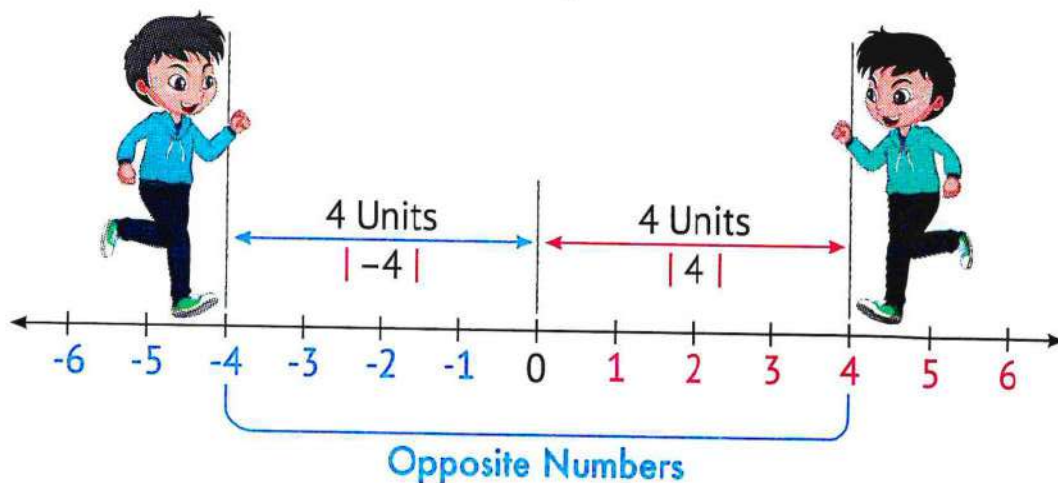


5&6 Lessons

Exploring Absolute Value Comparing Absolute Values

Absolute Value

- The absolute value is the **distance** between the position of a number and the position of zero on the number line.
- The absolute value of a number represents the **magnitude** of that number, regardless of the direction (positive or negative).
- The absolute value of " x " is denoted by $|x|$.



From the previous number line, we notice that:

- The distance between 4 and 0 is 4 units.

So, the absolute value of 4 is 4.

$$\rightarrow |4| = 4$$

- The distance between -4 and 0 is 4 units.

So, the absolute value of -4 is 4.

$$\rightarrow |-4| = 4$$

NOTE

- $|-4| = 4$

- $-|-4| = -4$

Practice 1 Find the **value** of each of the following:

- a $|-10| =$ b $|4| =$
 c $|\frac{2}{3}| =$ d $|\frac{4}{7}| =$
 e $|2.05| =$ f $|-12.5| =$

Practice 2 Find the value of "**x**" in each of the following:

- a If $|9| = x$, then $x =$
 b If $|-15| = x$, then $x =$
 c If $|-1.2| = x$, then $x =$
 d If $|-2| + |-9| = x$, then $x =$
 e If $|x| = 6$, then $x =$, or $x =$

NOTES

- The absolute value of any number is a **positive number**, except zero.
- The absolute value of zero is **zero**. $|0| = 0$
- Opposite numbers on a number line have the **same** absolute value.
- The **highest** possible absolute value is the **farthest** from **zero**.
- The **smallest** possible absolute value is **closer** to **zero**.

Comparing Absolute Values

Example: Compare using ($<$, $=$, or $>$):

a $|-3| \dots |3|$ ↓ ↓ 3 = 3	b $-|5| \dots |-5|$ ↓ ↓ -5 < 5	c $-|-4| \dots |-7|$ ↓ ↓ -4 < 7
--	---	--

Practice 3

Compare using ($<$, $=$, or $>$):

a -1.4 $|-1.4|$

b $|-4|$ $-|-4|$

c $|-2.71|$ 2.7

d $|-8.2|$ -7.9

e $-|9\frac{3}{5}|$ $|-9\frac{3}{4}|$

f $5\frac{5}{6}$ $|- \frac{35}{6}|$

Practice 4

Arrange the following numbers in an ascending order:

 2.5 , -3.4 , $|-5.3|$, -4 , $|0.8|$

Practice 5

Answer the following:

- a It is -5°C in freezer A and -22°C in freezer B. Which freezer has the lower temperature?
-
-

- b Lake A has a positional distance of -16 meters, and Lake B has a positional distance of -6 meters. Which lake is located farther below sea level?
-
-

- c Which is the greater rational number: -4.88 or -4.8 ?
-
-



10

1 Compare using ($<$, $=$, or $>$):

a -0.5 $|-0.7|$

b $|-56|$ 2.5

c 0 $|0|$

d $|- \frac{2}{9}|$ $-\frac{2}{7}$

2 Complete the following:

a $|-48| \div |-6| = \dots\dots\dots$

b If $|-5| = k$, then $k = \dots\dots\dots$

c $3 + |-7| = \dots\dots\dots$

d If $-|-3| = x$, then $x = \dots\dots\dots$

3 Arrange the following numbers in an **ascending** order:

$-\frac{1}{3}$, $|\frac{2}{3}|$, $\frac{9}{5}$, $|1\frac{1}{3}|$

..... / / /

4 Arrange the following numbers in a **descending** order:

$|-0.02|$, 0.2 , $-|2\frac{1}{2}|$, $\frac{1}{2}$

..... / / /

Unit

3

Algebraic Expressions

Concept 3.1

Use and Analyze Expressions

Lessons

1&2

Creating Mathematical Expressions Analyzing Mathematical Expressions

Learning Objectives:

By the end of these lessons, the student will be able to:

- Use a variable in a mathematical expression to communicate multiple pieces of data.
- Define the elements of algebraic expressions such as term, like terms, constants, and coefficients.

Lesson

3

Writing Algebraic Expressions

Learning Objectives:

By the end of this lesson, the student will be able to:

- Use a life-size number line to act out numeric and algebraic expressions.
- Write verbal expressions that represent numeric expressions and algebraic expressions that represent real-world scenarios.



1&2 Lessons

Creating Mathematical Expressions Analyzing Mathematical Expressions

Example: • If the price of one pen is 3 pounds, then the price of:

2 pens:	3	x	2
3 pens:	3	x	3
4 pens:	3	x	4
5 pens:	3	x	5

Values don't change

Constant

Values change

Variable

- The price of the pen is **constant**.
- The number of purchased pens is **variable**.

Constant

- It is a number or a letter that represents a single number.

Examples: 5 , - 1.2 , 127 , $\frac{5}{9}$

Variable

- It's a symbol, usually a letter, representing an unknown quantity that may vary or change.

Examples: x , y , z , ...

Algebraic Term

- It is the product of multiplying numbers and variables.

Constant

$4n$

Variable

Constant

$-\frac{5}{6}xy$

Variable

An algebraic term may be:

A variable only,



such as: x , y , z , ... , its coefficient is "1".

A constant only,



such as: 5 , - 1.2 , 127 , $\frac{5}{9}$

Practice 1 Complete the following table:

	Algebraic Term	Coefficient	Variables
<i>Example:</i>	$9xy$	9	x, y
a	$3m$		
b	$-5y$		
c	ab		
d	$-\frac{3}{7}n$		
e	$6xyz$		

Mathematical Expressions

Numerical Expression

Algebraic Expression

Numerical Expression

- It is a mathematical statement that contains a group of numbers and at least one operation.

Example: $15 + 23 - 0.36$ **Algebraic Expression**

- It is a mathematical statement that may contain a group of numbers, variables, operation symbols ("+", "-"), or any of them.
- Or, it consists of one or more algebraic terms separated by a "+" or "-" sign.

Example:

Coefficient

Variable

Constant

 $2x$

-

 3

Algebraic Term

 $x + 2, 5x + 3y$ $xy - 3y + 4$

Practice 2 Classify the following mathematical expressions into **numerical expressions** or **algebraic expressions**.

Put a tick (✓):

	Mathematical Expression	Numerical Expression	Algebraic Expression
a	$3 + 0.2 - 1.25$		
b	$5x - 3$		
c	9×2.7		
d	$2a + 3c - 5$		
e	$9x$		

Practice 3 Complete the following table:

	Mathematical Expression	Variables	Constants	Coefficients
	Example: $3a + 6b + 7$	a, b	7	3, 6
	Example: $-8xy + \frac{1}{3} + 20$	x, y	$\frac{1}{3}, 20$	-8
a	$2a + 7 + 4c$			
b	$17 + 5 + x$			
c	$22 + \frac{1}{5} + 2y$			
d	$0.2q + 0.6r + 0.8s$			
e	8			

Like and Unlike Terms

- Algebraic terms are like if they have the same variable exactly.
- Examples of like algebraic terms: $(2a, -5a, a)$, $(5xy, -7xy, xy)$
- Examples of unlike algebraic terms: $(6y, -8ab, 9x)$

NOTE

- All numerical terms (constants) are like terms.

Example: Complete the following table:

	Expression	Number of Terms	Like Terms
a	5	1	None
b	$8 + 2$	2	2, 8
c	$5b + 6 + 2b$	3	$5b$, $2b$
d	$3x + 7$	2	None

Practice 4 Complete the following table:

	Expression	Number of Terms	Like Terms
a	$x + \frac{3}{8}x + 3$		
b	$m + 3 + 2m + 2$		
c	$16x + 2x$		
d	$7x + 7x + 1 + 2x$		

Writing a mathematical expression:

Example: If an astronaut is approximately 0.05 meters taller while traveling in space than he is on Earth, write a mathematical expression that represents the astronaut's height on Earth if his height in space is h meters.

Answer: Mathematical expression: $h - 0.05$

Practice 5

Write a **mathematical expression** that represents each of the following situations:

- The weight of the astronaut on the moon is $\frac{1}{6}$ his weight on the Earth. If the weight of the astronaut on Earth is m kg, then his weight on the moon is:
- If Ahmed sleeps for 7 hours a day, then the number of hours he sleeps in n days is:

Quiz?

10

1 Choose the correct answer:

- In the algebraic term " $-5xy$ ", the coefficient is (y or x or 5 or -5)
- Like terms for the algebraic expression " $3 + 5a + 2a$ " are
(3 and $5a$ or $5a$ and $2a$ or 3 and $2a$ or 3, $5a$, and $2a$)
- The number of terms of the algebraic expression $2.5x + 2xy - 4$ is
(3 or 4 or 5 or 6)

2 Complete the following:

- The types of mathematical expressions are or
- $7 \times (2.7 + 1.3)$ is a/an expression.
- The variable(s) in the algebraic term: $5ab$ is/are

3 Match:

a In $(3x + 7)$, 7 is a

b In $(3x + 7)$, 3 is a

c In $(3x + 7)$, x is a

coefficient 1

variable 2

constant 3

3

Lesson

Writing Algebraic Expressions

Converting Algebraic Expressions into Verbal Expressions

- The algebraic expression can be written in words. This is called a verbal expression.
- There are words or phrases that can be used to suggest the operation in a mathematical problem, such as:

Addition



- Added to
- Sum
- The total
- More
- Plus
- Exceeded
- And
- Together
- Increase

Examples:

- x plus 8 is $x + 8$.
- The sum of x and 2 is $x + 2$.

Subtraction



- Subtracted
- How much is
- The decrease
- Take away
- Less
- The increase
- The difference
- Minus

Examples:

- x minus 3 is $x - 3$.
- 7 minus x is $7 - x$.

Multiplication



- Times
- Each
- Multiplication
- Times of
- Double
- Multiplied by
- Twice
- Triple
- Product
- Thrice

Examples:

- Twice x is $2x$.
- 5 multiplied by x is $5x$.
- 3 times x is $3x$.
- 4 times x is $4x$.

Division



- Divided by
- For each
- Quotient
- Ratio
- Half/quarter, ...
- Division
- Distribution

Examples:

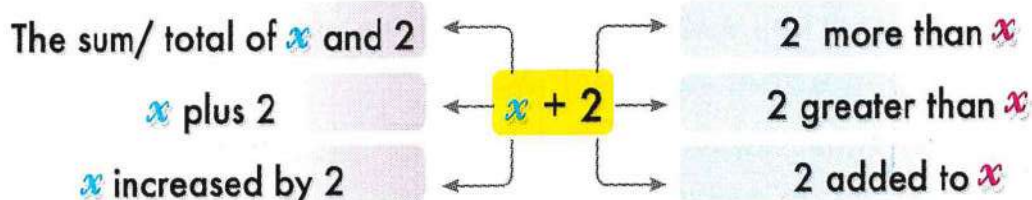
- Half of x is $\frac{1}{2}x = \frac{x}{2}$.
- Third of x is $\frac{1}{3}x = \frac{x}{3}$.

Practice 1 Express each of the following using algebraic expressions:

- a 5 more than x : (.....) b 3 less than y : (.....)
 c 4 multiplied by a : (.....) d Twice n : (.....)
 e Half of m : (.....) f 5 divided by t : (.....)

Example:

The following algebraic expression can be expressed using the verbal form in more than one way:



Practice 2 Write each of the following algebraic expressions using the word form. Name two different verbal expressions for each of them:

- a $x + 7$ { 1
 { 2
 b $x - 3$ { 1
 { 2
 c $8x$ { 1
 { 2
 d $\frac{x}{3}$ { 1
 { 2

NOTES

- An algebraic expression can have **more than one** operation.
- Parentheses are used to express the **result** of addition or subtraction.

Example: The following algebraic expressions have two operations:

$2x + 5$ Sum of the double of x and 5	$2(x + 5)$ Double of the sum of x and 5
$7x - 3$ The difference between 7 times x and 3	$7(x - 3)$ 7 times the difference between x and 3

Notice the change in the verbal expression when using parentheses.

Practice 3 Express each of the following verbal forms using algebraic expressions:

- | | |
|--|---------|
| a 6 is more than three times m . | (.....) |
| b 4 is less than 3 multiplied by a . | (.....) |
| c The sum of half of y and 7. | (.....) |
| d Twice the sum of b and 6. | (.....) |
| e The sum of twice b and 6. | (.....) |

Practice 4 Write each of these algebraic expressions using the verbal form:

- | | |
|------------------------|-------|
| a $3x + 2$: | ..... |
| b $4y - 6$: | ..... |
| c $\frac{1}{3}x - 4$: | ..... |
| d $6(a + 7)$: | ..... |
| e $3(s - 2)$: | ..... |

Practice 5 Choose the algebraic expression that represents each of the following:

- a Twelve is less than three times y .
 ($12 - 3y$ or $3y - 12$ or $3(y - 12)$ or $3(12 - y)$)

- b) Mohamed bought 4 boxes, each containing "c" of cookies.
($c + 4$ or $c - 4$ or $4c$ or $4 \div c$)
- c) Aunt Farah has collected the same number of eggs for two weeks, and in the third week, she cooked half of the eggs she collected previously. How many eggs does she have left? [$2 \div 14e$ or $(2 \div 14)e$ or $14e \div 2$ or $2e \div 14e$]
- d) Hazem's car needs one liter of gasoline to travel a distance of 15 km. How many liters does the car need for d km? ($15d$ or $15 + d$ or $\frac{15}{d}$ or $\frac{d}{15}$)

Quiz?

10

1 Write each of these algebraic expressions using the verbal form:

- a) $x - 2$:
- b) $5a + 7$:
- c) $36 - 2y$:

2 Choose the correct answer:

- a) If Kareem is y years old now, how old was he 3 years ago?
($y - 3$ or $y + 3$ or $3 \div y$ or $3y$)
- b) Twice the sum of 7 and x is
($2x + 7$ or $2(x + 7)$ or $27 + x$ or $2(2x + 7)$)
- c) The operations in the algebraic expression of: double the number minus 4 are:
(+ and - or x and - or x and + or x and $\div$)

3 Match each verbal expression to the appropriate algebraic expression:

- a) The sum of y and 3 is
- b) The sum of twice of y and 3 is
- c) The product of y and 3 is
- d) Twice the sum of y and 3 is

- $2y + 3$ 1
- $3y$ 2
- $2(y + 3)$ 3
- $y + 3$ 4

Unit

3

Algebraic Expressions

Concept 3.2

Algebraic Expressions and Exponents

Lesson

4

Ordering of Operations and Exponents

Learning Objectives:

By the end of this lesson, the student will be able to:

- Review the basic order of operations.
- Simplify numeric expressions that contain exponents.

Lessons

5-7

Evaluating Algebraic Expressions

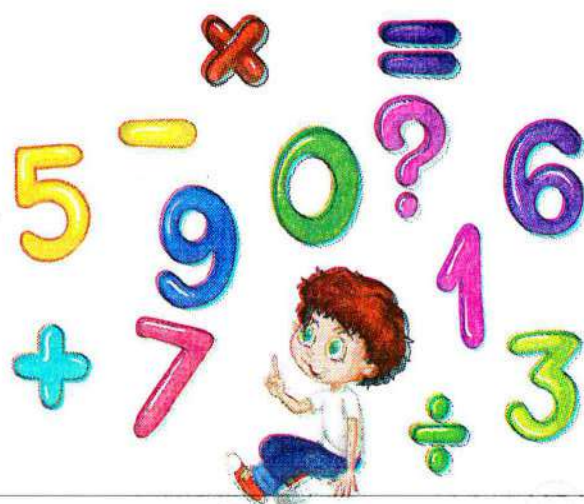
Applications on Algebraic Expressions

Determining Equivalent Algebraic Expressions

Learning Objectives:

By the end of these lessons, the student will be able to:

- Use substitution to evaluate algebraic expressions related to real-world situations.
- Evaluate expressions involving exponents and parentheses
- Explore whether two expressions are equivalent using a balance scale as a concrete model.



4 Lesson

Ordering of Operations and Exponents

Remember

Steps of the Order of Operations

1 Perform operations within parentheses ().

2 Perform operations within brackets [].

3 Perform operations outside of parentheses or brackets.

1 Multiply or divide from left to right.
2 Add or subtract from left to right.

1 Multiply or divide from left to right.
2 Add or subtract from left to right.

1 Multiply or divide from left to right.
2 Add or subtract from left to right.

Example: Use the **order of operations** to evaluate the expression:

Operations within parentheses

Adding

Operations within brackets

1 Dividing

2 Subtracting

Operations outside brackets

1 Multiplying

2 Adding

$$\begin{aligned}
 & 8 \times [24 \div (4 + 2) - 1] + 5 \\
 & = 8 \times [24 \div 6 - 1] + 5 \\
 & = 8 \times [4 - 1] + 5 \\
 & = 8 \times 3 + 5 \\
 & = 24 + 5 \\
 & = 29
 \end{aligned}$$

Practice 1

Use the **order of operations** to evaluate the following expressions:

a $4 \times 6 + 18 \div 3$

b $(5 + 8) \times (16 - 9)$

c $[1.5 \times (12 + 8)] - 15$

d $28 \div [4 \times (4 - 0.5)]$

Repeated Multiplication

- Repeated multiplication is the repeated multiplication of a number by itself a number of times.

Example: $2 \times 2 \times 2 \times 2$ (It is a repeated multiplication of 2 by itself 4 times.)

Repeated multiplication $2 \times 2 \times 2 \times 2$ can be written as 2^4 .

And it's read as: 2 to the power of 4 Or The fourth power of 2

We note that:

- 2 is the repeated number and is called the "base".
- 4 is the number of repetitions, and is called the "exponent, power, or index".

Exponent
 2^4
Base

Example: $4 \times 4 \times 4 = 4^3$, and it's read as: 4 to the power of 3.

NOTES

- Any number to the power of 1 = **itself**.

For example: $3^1 = 3$ "3 to the power of 1 Or the first power of 3"
The power of 1 is not written.

- $3 \times 3 = 3^2$ "3 to the power of 2 Or the second power of 3"
Or the square of 3."

- $4 \times 4 \times 4 = 4^3$ "4 to the power of 3 Or the third power of 4"
Or the cube of 4."

- $2^5 \neq 2 \times 5$ **Because:** $2^5 = 2 \times 2 \times 2 \times 2 \times 2 = 32$ **While** $2 \times 5 = 10$

- Any number to the zero power equals 1. (Except zero)

Examples: $3^0 = 1$, $6^0 = 1$, $(-4)^0 = 1$

- 1 to the power of any number = 1.

Examples: $1^9 = 1$, $1^5 = 1$, $1^7 = 1$

- 0 to the power of any number = 0. (Except zero)

Examples: $0^6 = 0$, $0^2 = 0$, $0^{23} = 0$

Practice 2 Complete the following:

- a $9 \times 9 \times 9 = 9^{\quad}$ b $7 \times 7 \times 7 \times 7 \times 7 \times 7 = \dots^6$
- c $\dots \times \dots \times \dots \times \dots = 7^4$ d $3^2 = \dots$ e $2^3 = \dots$
- f $5^0 = \dots$ g $0^3 = \dots$ h $1^7 = \dots$ i $8^{\quad} = 1$
- j $\dots^5 = 1$ k $\dots^4 = 0$

Order of Operations and Exponents

- When an expression contains exponents, their values are calculated **before** multiplication and division.

1 Perform operations within parentheses ().

2 Perform operations within brackets [].

3 Perform operations outside of parentheses or brackets.

- 1** Exponents
- 2** Multiply or divide from left to right.
- 3** Add or subtract from left to right.

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- 2** Multiply or divide from left to right.
- 3** Add or subtract from left to right.

Example: Use the **order of operations** to evaluate the expressions below:

$$\begin{aligned}
 \text{a } & (15 - 9) + 3 \times 4^2 \div 2 \\
 &= 6 + 3 \times 4^2 \div 2 \\
 &= 6 + 3 \times 16 \div 2 \\
 &= 6 + 48 \div 2 \\
 &= 6 + 24 \\
 &= 30
 \end{aligned}$$

$$\begin{aligned}
 \text{b } & 6^2 \div (17 - 8) \times (3 + 4) \\
 &= 6^2 \div 9 \times 7 \\
 &= 36 \div 9 \times 7 \\
 &= 4 \times 7 \\
 &= 28
 \end{aligned}$$

Practice 3

Use the **order of operations** to evaluate the expressions below:

a $2 \times 5 + 3^2$

.....

.....

.....

b $64 \div 2^4 \times 5$

.....

.....

.....

c $20 \times (5 + 4) - 5^2 \times 4$

.....

.....

.....

d $10^2 \times [3 \times (2.35 - 1.12)]$

.....

.....

.....



10

1 Find the value of:

a $3^3 =$

b $48 \div 8 \times 2 =$

c $8 \times (12 \div 4) =$

d $8 + 5^2 - 3^{\text{zero}} =$

e $(2^5 + 3) \div (2^3 - 1) =$

2 Choose the correct answer:

a $4^3 =$

($4 + 3$ or 4×3 or $4 + 4 + 4$ or $4 \times 4 \times 4$)

b $(10 \times 3 - 8) - 5 \times (6 - 2)$

(8 or 0 or 2 or 68)

c 3^2 2^3

($<$ or $=$ or $>$ or $\leq$)

d $2^3 + 2^3 =$

(4^3 or 3^4 or 2^4 or 4^6)

e $7^{\text{.....}} = 7$

(0 or 1 or 2 or 10)

5.7

Lessons

Evaluating Algebraic Expressions

Applications on Algebraic Expressions

Determining Equivalent Algebraic Expressions

Writing an Algebraic Expression

Example: If the price of a small bottle of water is 3 pounds, find the price of " x " bottles.

- Answer:**
- The price of a bottle is constant, while the number of bottles changes.
 - The price of " x " bottles is $3x$.

Example: If the price of one shirt is 100 pounds, and you have a coupon for 40 LE off your entire purchase. Find the price of " y " shirts.

- Answer:**
- The price of a shirt is constant, while the number of shirts changes.
 - The price of " y " shirts (before using the coupon) is $100y$.
 - The price of " y " shirts (after using the coupon) is $100y - 40$.

Practice 1 Write the algebraic expression that represents each of the following situations:

a If the price of one book is 25 pounds, what is the price of " a " books?

b If a meal costs 65 pounds, what is the price of " b " meals of the same type?

- c Medhat bought " x " kilograms of chocolate and put them in a box that costs 5 pounds. If the price of one kilogram is 34 pounds, what is the amount that Medhat paid?
-
-

- d Mona saved 22 pounds and bought 3 notebooks, the price of each one is y pounds. How much money does Mona have left?
-
-

Evaluating the Algebraic Expression

- You can find the value of an algebraic expression by replacing the variable used with a numerical value and then following the order of operations to find the numerical value of that expression.

Example: Use the **order of operations** to evaluate the expressions:

a $6 \div (8x - 3)$, [for $x = 0.5$]

$$\begin{aligned}
 &= 6 \div (8 \times 0.5 - 3) \\
 &= 6 \div (4 - 3) \\
 &= 6 \div 1 \\
 &= 6
 \end{aligned}$$

b $9 + (p^2 - 3) \div 2$, [for $p = 5$]

$$\begin{aligned}
 &= 9 + (5^2 - 3) \div 2 \\
 &= 9 + (25 - 3) \div 2 \\
 &= 9 + 22 \div 2 \\
 &= 9 + 11 = 20
 \end{aligned}$$

Practice 2 Use the **order of operations** to evaluate the expressions below:

a $5m + 2$, [For $m = 0.4$]

=
=
=

b $9y - 2^3$, [For $y = 2$]

=
=
=

c $28 \div (n + 2) + 7$, [For $n = 5$]

=
=
=

d $12 \div (a^2 - 10)$, [For $a = 4$]

=
=
=

e $b^3 \times 3 \div 6$, [For $b = 2$]

=
=
=

f $6^2 \div 3 \times (a - 2)$, [For $a = 4$]

=
=
=

Practice 3 A worker in a factory receives a daily wage of **100** pounds for working for a specified number of hours, in addition to an amount of **30** pounds for every additional hour of work.

- a Write an **algebraic expression** that expresses the wage that the worker receives on a day on which he worked for y of overtime hours.

- b If the number of overtime hours is **3** hours, what is the amount of money that he gets for that day?

Equivalent Algebraic Expressions

- Algebraic expressions are equivalent if they represent the same value for every value of the variable(s).

Example: Evaluate each of the following expressions using **two different positive integers** of your choice. If the expressions are **equal**, write **yes**. If they are **not equal**, write **no**.

a	$x + 2x$	$2(x + 2)$	Equal or Not?
If $x = 1$	$1 + 2 \times 1$ $= 1 + 2 = 3$	$2 \times (1 + 2)$ $= 2 \times 3 = 6$	No
If $x = 2$	$2 + 2 \times 2$ $= 2 + 4 = 6$	$2 \times (2 + 2)$ $= 2 \times 4 = 8$	No

From the previous table, we find that:

- The two algebraic expressions " $x + 2x$ " and " $2(x + 2)$ " are not always equal, **so** they are not equivalent.

b	$6x + 3$	$3(2x + 1)$	Equal or Not?
If $x = 3$	$6 \times 3 + 3$ $= 18 + 3$ $= 21$	$3 \times (2 \times 3 + 1)$ $= 3 \times (6 + 1)$ $= 3 \times 7 = 21$	Yes
If $x = 4$	$6 \times 4 + 3$ $= 24 + 3$ $= 27$	$3 \times (2 \times 4 + 1)$ $= 3 \times (8 + 1)$ $= 3 \times 9 = 27$	Yes

From the previous table, we find that:

- The two algebraic expressions " $6x + 3$ " and " $3(2x + 1)$ " are always equal, **so** they are equivalent.

c	$3x - 2$	$3 - (x + 1)$	Equal or Not?
If $x = 1$	$3 \times 1 - 2$ $= 3 - 2 = 1$	$3 - (1 + 1)$ $= 3 - 2 = 1$	Yes
If $x = 2$	$3 \times 2 - 2$ $= 6 - 2 = 4$	$3 - (2 + 1)$ $= 3 - 3 = 0$	No

From the previous table, we find that:

- The two algebraic expressions " $3x - 2$ " and " $3 - (x + 1)$ " are not always equal, **so** they are not equivalent.

Practice 4 Evaluate each of the following expressions using **two different positive integers** of your choice. If the expressions are **equal**, write **yes**. If they are **not equal**, write **no**.

a	$3x + 6$	$x + 3 + 2(x + 1)$	Equal or Not?
If $x = \dots\dots\dots$			
If $x = \dots\dots\dots$			

From the previous table, we find that:

- The two algebraic expressions are $\dots\dots\dots$.

(equivalent **or** not equivalent)

b	$4x + 6$	$3(x + 2)$	Equal or Not?
If $x = \dots\dots\dots$			
If $x = \dots\dots\dots$			

From the previous table, we find that:

- The two algebraic expressions are
(equivalent or not equivalent)

c	$2x + 2$	$2(x + 1)$	Equal or Not?
If $x = \dots\dots\dots$			
If $x = \dots\dots\dots$			

From the previous table, we find that:

- The two algebraic expressions are
(equivalent or not equivalent)

Quiz?

10

1 Complete the following:

- a If the price of one pen is 9 pounds, what is the price of k pens is:
- b If Lojy saves z pounds per day, she saves pounds in a week.
- c The value of the expression $2x$, (for $x = 7$) is
- d Are the two expressions $2(x + 3)$ and $4x + 6$ equivalent?
..... (Yes or No)

2 Match:

a The value of $b^3 - 4b \div 2$, [for $b = 2$] is...

7 1

b The value of $x^2 + x^3 - 10$, [for $x = 2$] is...

4 2

c The value of $(y^2 - 1) \div 5$, [for $y = 6$] is...

2 3

3 Choose the correct answer:

- a $3a + 7 = 25$ when $a =$ (5 or 6 or 7 or 8)
- b $c^3 + 1 = 9$ when $c =$ (1 or 5 or 8 or 2)
- c $4y - 10 = 14$ when $y =$ (6 or 5 or 8 or 2)

Unit

4

Equations and Inequalities

Concept 4.1

Write and Solve Equations and Inequalities

Lesson



Solving Algebraic Equations

Learning Objective:

By the end of this lesson, the student will be able to:

- Use a pan balance to model and solve algebraic equations.

Lessons



Exploring Inequalities Solving Inequalities

Learning Objectives:

By the end of these lessons, the student will be able to:

- Explore signs that indicate a restriction such as a speed limit, a sale markdown, a weight limit, or a capacity limit.
- Analyze these scenarios and determine how they differ from equation scenarios.
- Use a number line to represent inequalities.

$$y < 7$$

$$x > 5$$

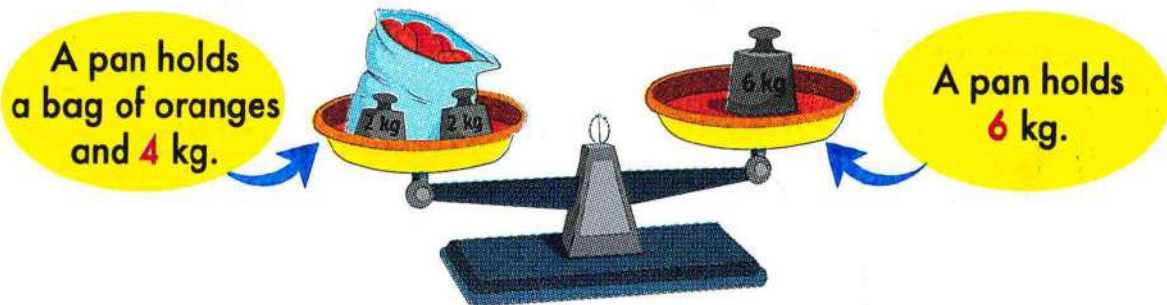


1 Lesson

Solving Algebraic Equations

The Concept of Equation

The following figure shows a scale with two pans.



- If we denote the mass of the bag of oranges as " x " kilograms:
so, the total mass on the left side is $(x + 4)$ kilograms.
- The mass of the two pans is equal when
 $x + 4 = 6$ or when $x = 2$.
- This means that the mass of the two pans is equal when the mass of the orange bag is 2 kg.

NOTES

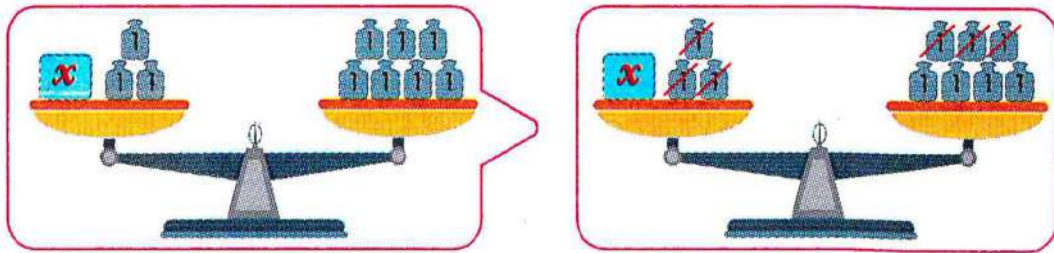
- $x + 4 = 6$ is called an equation.
 - The letter " x " is called "unknown" or "variable".
 - The number "2" is called the solution to the equation (the value of x).
- **The equation:** is a mathematical sentence that includes an equal relationship between two mathematical expressions.
 - The equation has two sides with an (=) sign between them.
 - Solving an equation means finding the value of the (unknown) variable.

Examples on the equations:

$$x + 3 = 8 \quad , \quad x - 6 = 2 \quad , \quad 3x = 12 \quad , \quad \frac{x}{3} = 5$$

Example: Write the **equation** that represents each of the following models, then find the value of " x ":

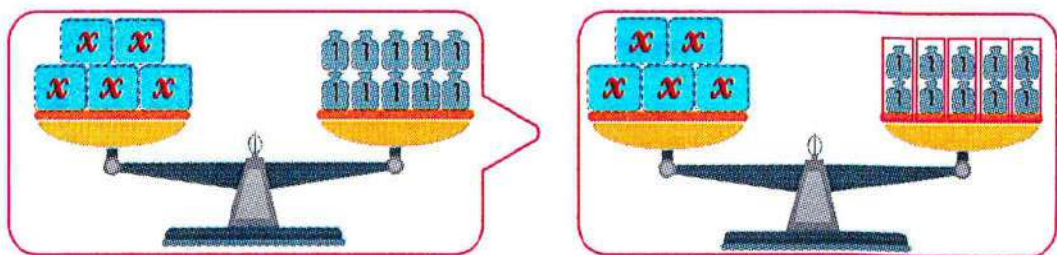
a



Equation: $x + 3 = 7$

$x = 4$

b



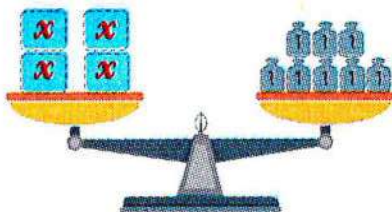
Equation: $5x = 10$

$x = 2$

Practice 1

Write the **equation** that represents each of the following models, then find the value of " x ":

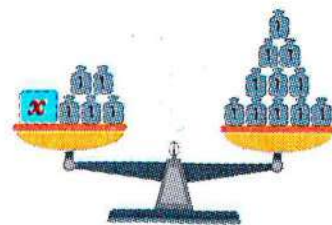
a



Equation: _____

x : _____

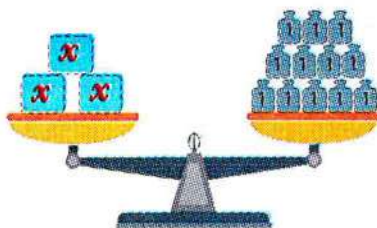
b



Equation: _____

x : _____

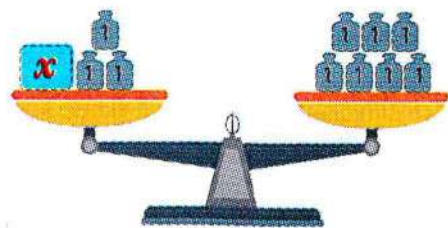
c



Equation: _____

x : _____

d



Equation: _____

x : _____

Solving Equations

- Adding the **same value** to both sides of an equation does not change its **equality**.

Example: $b - 3 = 4$

By adding 3 to both sides of the equation:

$$\begin{aligned} b - \cancel{3} + \cancel{3} &= 4 + 3 \\ b &= 7 \end{aligned}$$

- Subtracting the **same values** from both sides of an equation does not affect its **equality**.

Example: $a + 5 = 9$

By subtracting 5 from both sides of the equation:

$$\begin{aligned} a + \cancel{5} - \cancel{5} &= 9 - 5 \\ a &= 4 \end{aligned}$$

- Dividing both sides of an equation by the **same value** (not equal to zero) does not affect its **equality**.

Example: $5m = 15$

By dividing both sides of the equation by 5:

$$\begin{aligned} \frac{\cancel{5}m}{\cancel{5}} &= \frac{15}{5} \\ m &= 3 \end{aligned}$$

- Multiplying both sides of an equation by the **same value** (not equal to zero) does not affect its **equality**.

Example: $\frac{1}{3}n = 2$

By multiplying both sides of the equation by 3:

$$\begin{aligned} \frac{1}{\cancel{3}}n \times \cancel{3} &= 2 \times 3 \\ n &= 6 \end{aligned}$$

Practice 2 Find the value of the **variable** in each of the following equations (solve the equation):

a $x + 7 = 15$

b $a - 6 = 5$

c $4 + y = 6$

.....

.....

d $6m = 18$

.....

.....

e $\frac{n}{5} = 3$

.....

.....

f $\frac{1}{4}t = 2$

.....

.....

Quiz?

10

1 Find the value of the **variable** in each of the following equations (solve the equation):

a $x + 2 = 11$

.....

.....

b $m - 7 = 9$

.....

.....

c $5y = 45$

.....

.....

d $\frac{k}{8} = 6$

.....

.....

2 Choose the correct answer:

a If $m + 7 = 25$, then $m =$ (7 or 10 or 18 or 20)

b If $k = 10$, then $k -$ = 4. (10 or 4 or 2 or 6)

c If $3f = 27$, then $f =$ (8 or 9 or 7 or 4)

2&3 Lessons

Exploring Inequalities Solving Inequalities

Example: If Farida has **100 pounds**, what can she choose from the following?

					
70 LE	20 LE	400 LE	100 LE	53 LE	150 LE
☒	☒	☐	☒	☒	☐

So, the price of items should be less than or equal to **100 pounds**.

Practice 1 The sign shows the speed limit for a road in kilometers per hour. Record all speeds that are acceptable to drive on the road.



- | | |
|------------|------------|
| a 48 km/hr | b 40 km/hr |
| c 50 km/hr | d 43 km/hr |
| e 30 km/hr | f 49 km/hr |

Practice 2 The sign shows the sale prices of some clothes on a sale rack. Use the sign to determine any prices you might expect to pay for an item from this rack. Record all prices that apply.



- | | |
|-------------|-------------|
| a 140.99 LE | b 290.99 LE |
| c 180.99 LE | d 120.99 LE |
| e 150.49 LE | f 150.99 LE |

Inequality

- It is a mathematical relationship that compares the values of two mathematical expressions by using the inequality signs.

Signs of the inequality

are read as:



Greater than



Less than



Greater than
or equal to



Less than or
equal to

Solving Inequalities by Using a Number Line

The Solution of the Inequality

- It is finding the value of the variable (unknown) that make the inequality relation true.

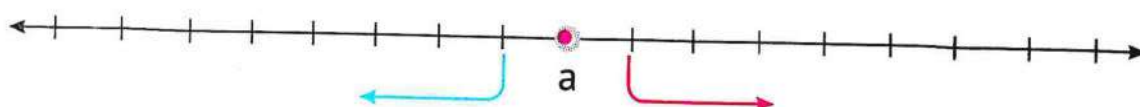
Representing Inequalities on a Number Line

- All integers are represented by dots at their positions on the number line, connected by a line that extends without a limit in both directions.

If "a" is an integer and it is represented on the number line, then:

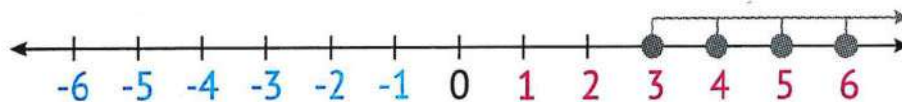
All numbers to the left of "a" are less than it.

All numbers to the right of "a" are greater than it.



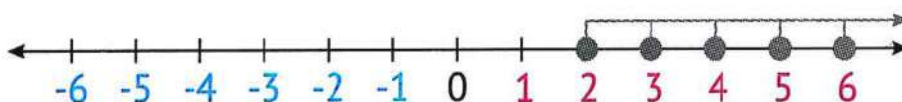
Examples:

- a $x > 2$ is read as x is greater than 2.



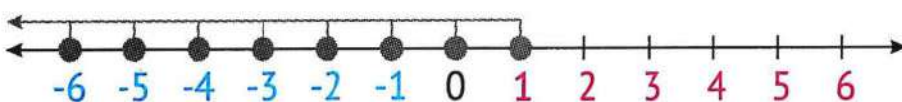
- The set of values that satisfy the inequality is 3, 4, 5, 6, 7, 8, ...
(All integers greater than 2)

- b $x \geq 2$ is read as x is greater than or equal to 2.



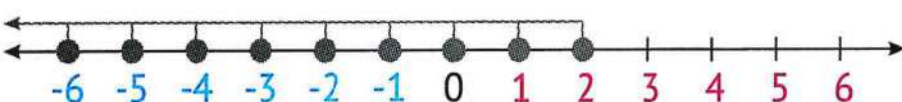
- The set of values that satisfy the inequality is 2, 3, 4, 5, 6, 7, 8, ...
(All integers greater than or equal to 2)

- c $x < 2$ is read as x is less than 2.



- The set of values that satisfy the inequality is 1, 0, -1, -2, -3, -4, -5, ...
(All integers less than 2)

- d $x \leq 2$ is read as x is less than or equal to 2.



- The set of values that satisfy the inequality is 2, 1, 0, -1, -2, -3, -4, -5, ...
(All integers less than or equal to 2)

Practice 3 Write the **inequality** that represents each of the following expressions:

- a All values greater than 4:
- b All values less than -3 :
- c All values greater than or equal to -1 :
- d All values less than or equal to 5:
- e All values to the right of 7 on the number line:
- f All values to the left of -1 on the number line plus -1 :

Practice 4 Write what each of the following **inequalities** represents:

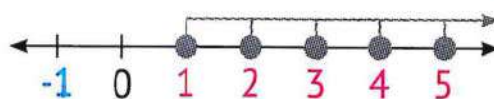
- a $x > -5$: All values
- b $x < 1$: All values
- c $x \leq -2$: All values
- d $x \geq 4$: All values

NOTES

- The sets of numbers can be represented as the following:

The set of counting numbers

$$x \geq 1 \text{ or } x > 0$$



The set of natural numbers

$$x \geq 0 \text{ or } x > -1$$



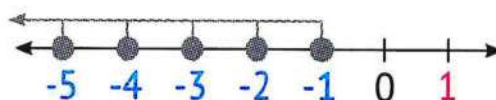
The set of positive integers

$$x > 0 \text{ or } x \geq 1$$

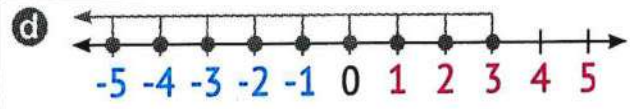
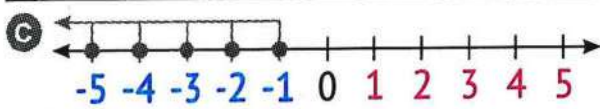
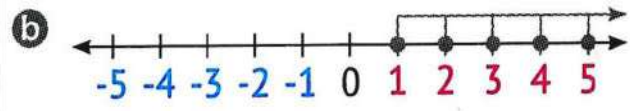
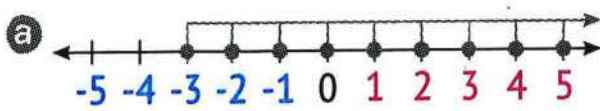


The set of negative integers

$$x < 0 \text{ or } x \leq -1$$

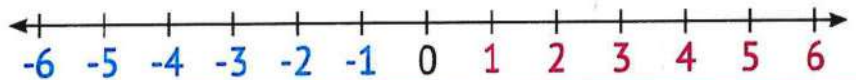


Practice 5 Write the suitable **inequality** represented by each number line in a set of integers:

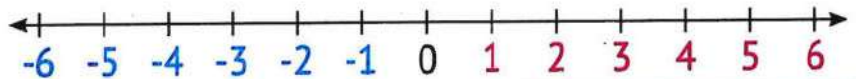


Practice 6 Name 3 solutions to each inequality. Then, **graph** the inequality on a **number line** in a set of integers:

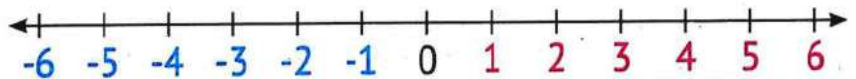
a $x > 0$



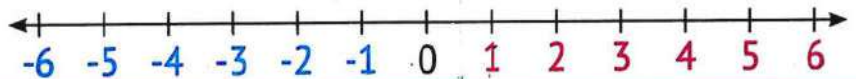
b $x < 0$



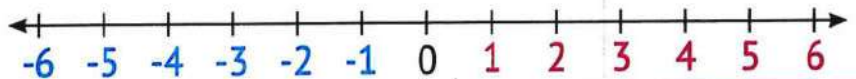
c $x \geq -1$



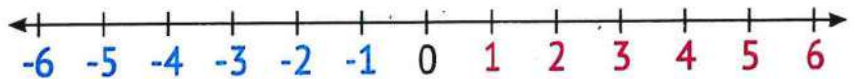
d $x \leq -1$



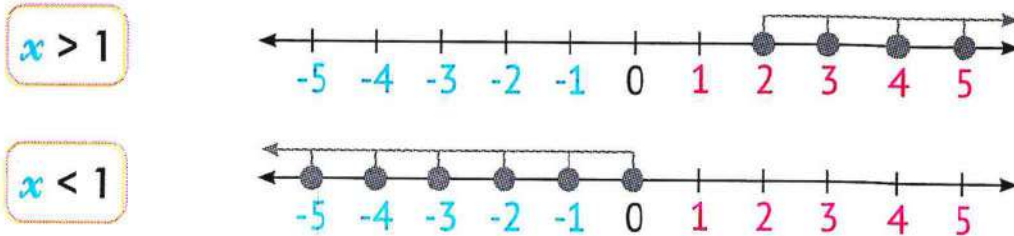
e $x > 4$



f $x \leq 3$



Example: • The representation of the inequalities $x > 1$ and $x < 1$ on the number line, where x is an integer:



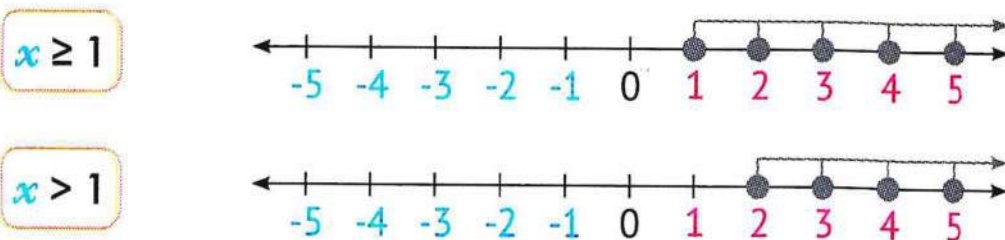
• The two inequalities are similar in:

- The number 1 does not belong to the solution set in each of them.

• The two inequalities differ in:

- Each of them represents the values in two opposite directions from the number 1.
- They have no common points.

Example: • The representation of the inequalities " $x \geq 1$ " and " $x > 1$ " on the number line, where x is an integer number:



• The two inequalities are similar in:

- Each of them represents the values to the right of the number 1.
- There are many common points between them.

• The two inequalities differ in:

- The number 1 does not belong to the solution set in the inequality " $x > 1$ ".
- The number 1 belongs to the solution set in the inequality " $x \geq 1$ ".

Practice 7

Choose all the correct sentences about the representation of the inequalities (" $x > -2$ " and " $x < -2$ ") on the number line:

- a -2 belongs to the solution set in each of them. ()
- b -2 belongs to the solution set in one of them. ()
- c The inequality " $x > -2$ " includes all values to the left of -2 on the number line. ()
- d The inequality " $x > -2$ " includes all values to the right of -2 on the number line. ()
- e They have no points in common. ()

Practice 8

Record each true statement about the graphs of (" $x > -2$ " and " $x \geq -2$ ") on the number line.

- a -2 belongs to the solution set in each of them. ()
- b -2 belongs to the solution set in one of them. ()
- c The inequality " $x \geq -2$ " includes all values to the left of -2 on the number line. ()
- d The inequality " $x > -2$ " includes all values to the right of -2 on the number line. ()
- e They have no points in common. ()

Quiz?

10

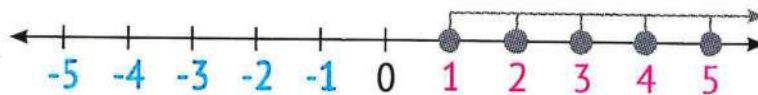
1 Write in a verbal form:

a $x > -5$

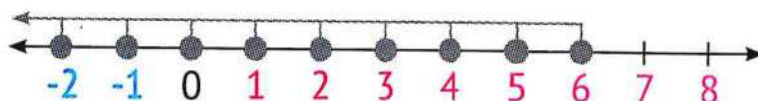
b $x \leq 2$

2 Write the inequality representing the number line in the set of integers:

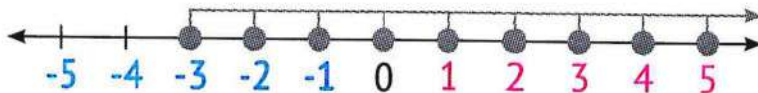
a



b



c



3 Choose the correct answer:

a The inequality representing the statement "All values greater than 2" is
 ($x > 2$ or $x < 2$ or $x \leq 2$ or $x \geq 2$)

b The inequality that represents the statement "All values to the right of -1 on a number line" is

($x > -1$ or $x < -1$ or $x \leq -1$ or $x \geq -1$)

c Which of the following values is a solution to the inequality " $x > -1$ "?

(1 or -3 or -2 or -5)

Theme

2

Mathematical Operations and Algebraic Thinking

(Statistics and
Data Analysis)

Theme Units

Unit

5

Dependent and
Independent Variables

Concept 5.1: Explore Relationships
Between Two Variables

Unit

6

Data Distributions

Concept 6.1: Applications on
Collecting and
Representing Data

Unit

7

Measures of
Central Tendency
and Spread

Concept 7.1: Exploring Measures of
Central Tendency and
Spread



Unit 5

Dependent and Independent Variables

Concept 5.1

Explore Relationships Between Two Variables

Lessons 1&2

The Relationship Between Dependent and Independent Variables

Applications on Dependent and Independent Variables

Learning Objectives:

By the end of these lessons, the student will be able to:

- Identify relationships within the context of going to an amusement park.
- Explore and apply formal definitions of independent variables and dependent variables.
- Examine and create algebraic equations to model real-life situations.

Lesson 3

Analyzing the Relationship Between Dependent and Independent Variables

Learning Objective:

By the end of this lesson, the student will be able to:

- Discover how to use dependent and independent variables when writing equations.

Lesson 4

Graph Representation for Dependent and Independent Variables

Learning Objectives:

By the end of this lesson, the student will be able to:

- Connect representations of dependent and independent variables in tables, equations, and graphs.
- Represent dependent and independent variables on a coordinate plane.

1&2 Lessons

The Relationship Between Dependent and Independent Variables & Applications on Dependent and Independent Variables

Dependent and Independent Variables

Variable

Independent Variable

- It's a variable whose value is not determined by any other value or variable.
- Therefore, any value can be assigned to it.

Dependent Variable

- It's an outcome variable that is determined by or based on the other variable (independent) as the input.

Example: If the price of one pen is 5 pounds, then the price of:

2 pens:	5	x	2	=	10	pounds
3 pens:	5	x	3	=	15	pounds
4 pens:	5	x	4	=	20	pounds
5 pens:	5	x	5	=	25	pounds

Constant

Independent Variable

Dependent Variable

- The price of the pen is **constant**.
- The number of purchased pens is a variable (**an independent variable**).
- The total purchase price of any number of pens is a variable (**a dependent variable**).
- The total purchase price of pens depends on the number of pens purchased. As the number of pens changes, the total price of pens also changes.

- If we denote the number of pens by the symbol x and the total purchase price by the symbol y , the equation that represents the relationship between the number of pens and the total purchase price is:

Variable y is called a dependent variable

$$y = 5x$$

Variable x is called an independent variable

- The independent variable is usually denoted by " x " and the dependent variable is denoted by " y ".
- Other symbols may be used.

Practice 1 Determine the independent and dependent variables in each of the following situations:

a The number of study hours and the exam result:

- Independent variable:
- Dependent variable:

b The job and level of education:

- Independent variable:
- Dependent variable:

c The distance traveled by a car and fuel consumption:

- Independent variable:
- Dependent variable:

d The amount paid and the number of chocolate bars:

- Independent variable:
- Dependent variable:

Practice 2 Determine the **independent variable** and the **dependent variable** in each of the following relationships:

Relationship	$x + 3 = y$	$m - 2 = z$	$s \times 7 = a$	$f = \frac{t}{7}$
Independent Variable				
Dependent Variable				

Example: The price of **one** kilogram of bananas is **9** pounds, and the price of **x** kilograms of bananas is **y** pounds.

- The equation that represents the relationship between the weight of bananas " x " and the purchase price " y " is **$y = 9x$** .
- The independent variable is " **x** ".
- The dependent variable is " **y** ".
- The price of **5** kilograms of bananas is **$9 \times 5 = 45$ pounds**.

Practice 3 Sameh is **6** years younger than his brother Ahmed. If Sameh is **x** years old, and Ahmed is **y** years old:

- The equation that represents the relationship between their ages is:
.....
- The independent variable is:
.....
- The dependent variable is:
.....
- If Sameh is now **12** years old, the age of Ahmed now is:
.....

Practice 4 In the amusement park, tickets are purchased to be used in each of the games. The following table shows the number of tickets required to ride **each game** for **one** time. Complete the table.

– Write an equation that represents the relationship between:

" x ": The number of times to ride a game

" y ": Total number of tickets needed

– Calculate the number of tickets required to ride each game **8** times.

Game	Ferris Wheel	Swing	Roller Coaster	Rotary Cars
Number of Tickets Required to Ride the Game 1 Time	3 Tickets	4 Tickets	6 Tickets	8 Tickets
The Equation	.....	.....	.....	.....
Number of Tickets Required to Ride the Game 8 Times	.....	.....	.....	.....

Quiz?

10

1 Complete the following:

- In the equation $y = 12x$, the independent variable is, and the dependent variable is
- If the value of the electricity bill depends on the amount of electricity consumption, then:
The independent variable is
The dependent variable is
- If the independent variable is the number of times the player hits the target and the dependent variable is the number of points the player gets, then depends on

2 Esraa saves **100** pounds every month. Complete:

- The equation that represents the relationship between the number of months " x " and the total money she saved " y " is
- The independent variable is
- The dependent variable is
- The money she saves in **6** months is

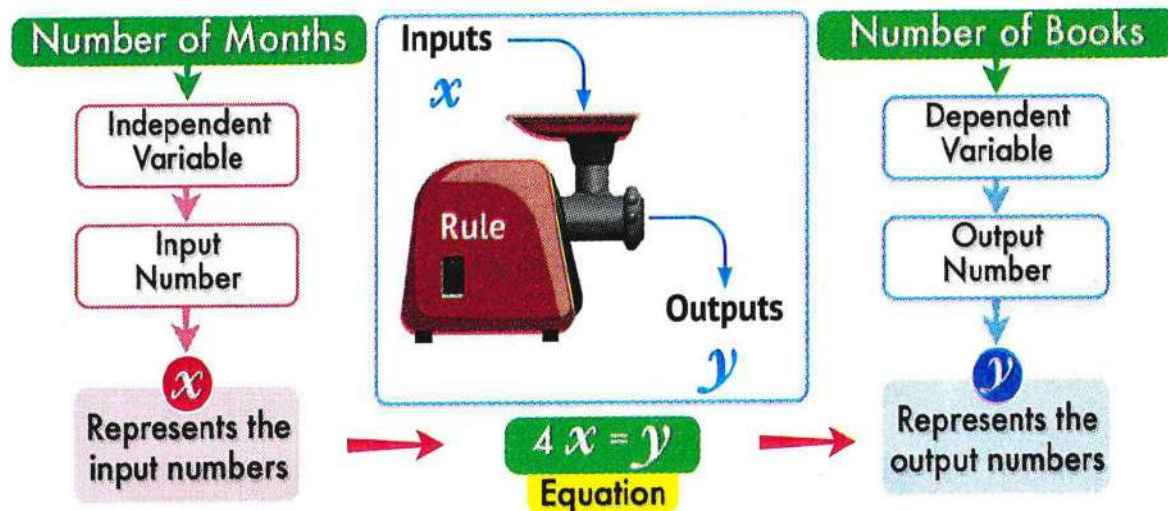
3 Lesson

Analyzing the Relationship Between Dependent and Independent Variables

Rules, Variables, and Equations - Inputs/Outputs

- If the average number of books a person reads per month is 4, note the following table:

Number of Months	1	2	3	4	5	6	x
Number of Books	4	8	12	16	20	24	y



NOTES

The input number → is the independent variable.

The output number → is the dependent variable.

The rule → is the relationship between the independent variable and the dependent variable.

Example:

Rule	Equation
Multiply by 3.	$y = 3x$
Add 5.	$y = x + 5$
Divide by 8.	$y = x \div 8$
Subtract 7.	$y = x - 7$
Multiply by 5, then subtract 2.	$y = 5x - 2$
Add 3, then divide by 7.	$y = (x + 3) \div 7$

NOTE

- When adding or subtracting before division or multiplication, you must use **parentheses**.

Practice 1

Use the variables x and y , where x is an independent variable. Write the **rule** and **equation** for each of the following:

	Rule	Equation
a	.....	$y = 8x$
b	Add 9.	.....
c	Divide by 3.	.....
d	.....	$y = 3x + 7$
e	.....	$y = (x - 3) \div 2$

Finding the Rule and Equation from the Table

- You can't always know the correct rule for a pattern with one input and one output. You may need **more than one** input and output.

Example: Notice the following patterns:

a	Inputs (x)	1	3	5	7
	Outputs (y)	4	6	8	10

• **Rule:** Add 3.

• **Equation:** $y = x + 3$

b	Inputs (x)	8	16	24	32
	Outputs (y)	2	4	6	8

• **Rule:** Divide by 4.

• **Equation:** $y = x \div 4$

Practice 2 Notice each table to identify the **rule**, then complete the **pattern**:

a	Inputs (x)	4	6	8	10	.....
	Outputs (y)	6	8	10	.....	14

• **Rule:**

• **Equation:** $y = \dots\dots\dots$

b	Inputs (x)	6	8	9	10	.....
	Outputs (y)	1	3	4	.....	9

• **Rule:**

• **Equation:** $y = \dots\dots\dots$

c	Inputs (x)	6	9	.....	15	18
	Outputs (y)	2	3	4	.....	6

• **Rule:**

• **Equation:** $y = \dots\dots\dots$

d	Inputs (x)	2	3	4	5	.....
	Outputs (y)	8	12	16	.....	24

• **Rule:**

• **Equation:** $y = \dots\dots\dots$

- A pattern rule can consist of more than one operation.

Example: Notice the following patterns:

a	x	3	5	7	8	• Rule: Multiply by 3, then add 1.
	y	10	16	22	25	• Equation: $y = 3x + 1$

b	x	5	9	13	21	• Rule: Subtract 1, then divide by 2.
	y	2	4	6	10	• Equation: $y = (x - 1) \div 2$

Practice 3 Notice each table and determine the rule. Write an equation, then complete the pattern in each table:

a	x	2	4	8	10	5	• Rule:
	y	4	10	22	28	.....	• Equation: $y =$

b	x	9	6	12	15	.....	• Rule:
	y	2	1	3	4	5	• Equation: $y =$

c	x	4	3	2	6	.....	• Rule:
	y	10	8	6	14	12	• Equation: $y =$

d	x	7	13	9	3	5	• Rule:
	y	3	6	4	1	.....	• Equation: $y =$

Practice 4 Complete the following statements using the variables x and y :

- a If the rule is "multiply by 2", then the equation is

So, If $x = 2.3$, then $y =$

- b If the rule is "add 6", then the equation is

So, if $x = \frac{1}{5}$, then $y =$

- c If the rule is "multiply by 3, then add 4",

the equation is

So, If $x = 5$, then $y =$

Quiz?

10

1 Complete the following:

- a If the rule is "add 8", then the equation is
- b The equation that expresses the rule "subtract from 3.2" is
- c If the equation is $y = 5(x + 2)$, and $x = 5$, then $y =$

2 Choose the correct answer:

- a The equation that expresses the rule "multiply by 4" is
($y = 3x$ or $y = 4 + x$ or $y = 4x$ or $y = x$)
- b The equation that expresses the rule "multiply by 2, then add 5" is
($y = 5x + 2$ or $y = 2(x + 5)$ or $y = 5(x + 2)$ or $y = 2x + 5$)
- c If $y = 2x + 3$, and $x = 2$, then $y =$ (10 or 7 or 13 or 17)

3 Notice the following table to identify the rule, and then complete the pattern:

Inputs (x)	1	2	3	4	.....
Outputs (y)	10	15	20	.....	30

• Rule:

• Equation: $y =$

4

Lesson

Graph Representation for Dependent and Independent Variables

Representing the Dependent and Independent Variables

To represent the independent and dependent variables on a coordinate plane as a graph:

- Put the **independent** (input) variable on the **x -axis** (horizontally).
- Put the **dependent** (output) variable on the **y -axis** (vertically).

Example: The following table represents the number of pens and their total price:

Number of Pens (x)

1

2

3

4

Total Price in Pounds (y)

3

6

9

12

• Points (x, y)

(1, 3)

(2, 6)

(3, 9)

(4, 12)

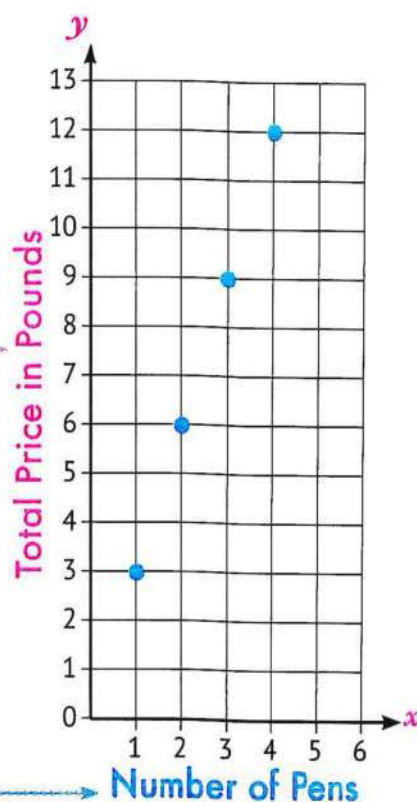
The equation that represents the relationship between the variables x and y is

$$(y = 3x)$$

(Vertically)

The total price in pounds (dependent variable) is represented on the y -axis.

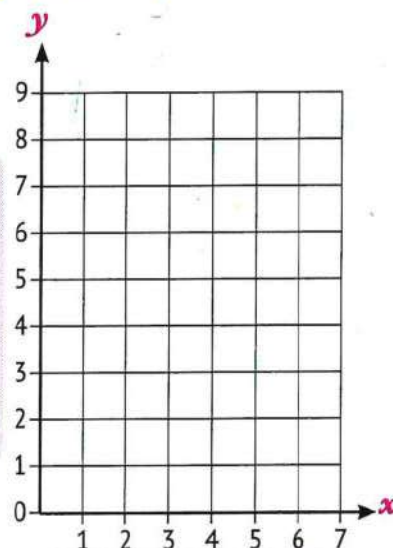
The number of pens (independent variable) is represented on the x -axis.
(Horizontally)



Practice 1 You went on **three** fewer rides than your friend because she got to the amusement park earlier than you. Complete the following table, where x represents the number of your rides and y represents the number of your friend's rides at different times during your amusement park visit. Write an **equation** to represent the relationship in the table you made. Then, represent that relationship **graphically**.

The equation is:

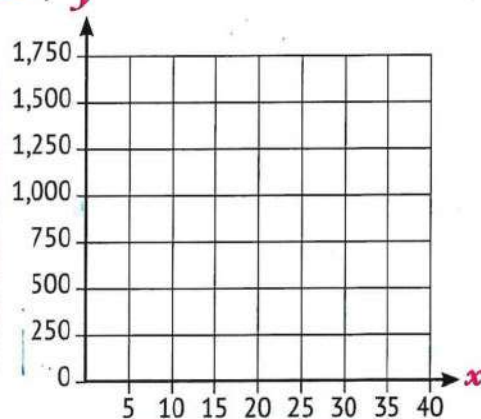
x	0	2	4	5	6
y					
Points	(,)	(,)	(,)	(,)	(,)



Practice 2 The value of participating in one of the school trips is **50** pounds. If the number of subscribers is " x ", y and the total value of subscriptions is " y ", write an **equation** that shows the relationship between the number of subscribers and the total subscriptions. Complete the table and graph it.

The equation is:

x	10	15	20	30
y				
Points	(,)	(,)	(,)	(,)

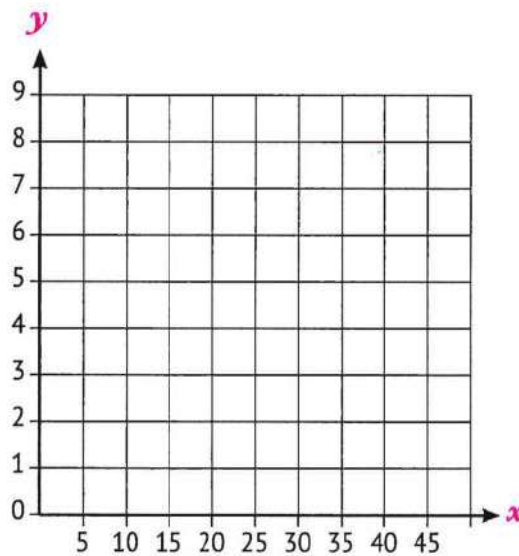




1 Complete the following:

- a The independent variable is represented on the-axis.
- b The dependent variable is represented on the-axis.
- c x -axis is the axis.
- d-axis is the vertical axis.

2 If the equation is $y = \frac{1}{5}x$, then complete the following table and graph it:



x	10	15	20	30	45
y	.....	.....	.....	.....	.....
Points	(.....,)	(.....,)	(.....,)	(.....,)	(.....,)

Unit

6

Data Distributions

Concept 6.1

Applications on Collecting and Representing Data

Lesson

1

Data and Statistical Questions

Learning Objectives:

By the end of this lesson, the student will be able to:

- Explore statistical questions and data.
- Compare and contrast statistical and non-statistical questions.

Lessons

2&3

Exploring the Histogram Representing Data Using Histograms

Learning Objectives:

By the end of these lessons, the student will be able to:

- Review characteristics of dot plots and bar graphs.
- Explore and discover characteristics of histograms.
- Create a histogram for a given set of data.
- Collect data using number cubes and create a histogram for that data.

Lesson

4

Exploring Box Plot

Learning Objective:

By the end of this lesson, the student will be able to:

- Calculate the median and 5-point summary of a data set and describe how these values are represented on a box plot.

Lesson

5

Applications on Data Representations

Learning Objective:

By the end of this lesson, the student will be able to:

- Analyze data displays to determine which is most appropriate when answering statistical questions.

1

Lesson

Data and Statistical Questions

Statistical Questions and Non-Statistical Questions

- The type of question is determined by the data we get from answering these questions.

Statistical Question

- It's a question for which we have **many possible** answers.

For example: How old are the students in your class?

It is a statistical question because we expect a change in the ages of the students.

Non-Statistical Question

- It's a question for which we have **only one** answer.

For example:

"How old are you?"

It is a non-statistical question because we expect only one answer.

Practice 1

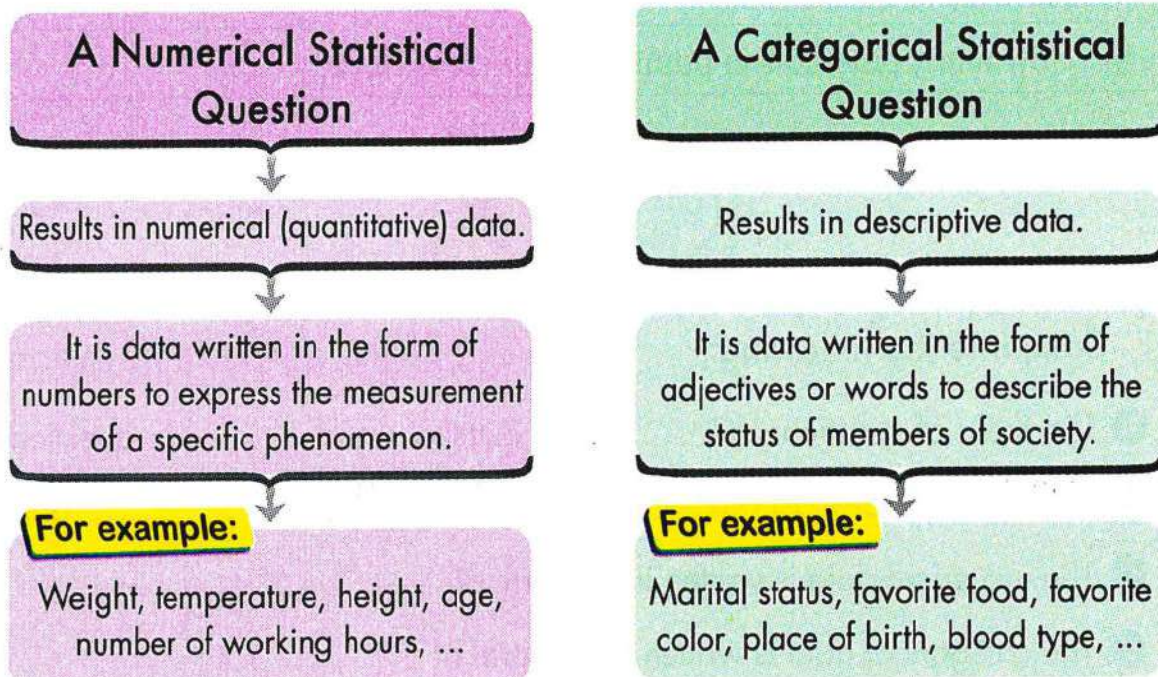
Select the **type** of each of the following questions:

(a **statistical question** or a **non-statistical question**)

	Question	Statistical	Non-Statistical
a	What are the students' favorite colors?		
b	How many family members does each student have in the class?		
c	How many students are there in the class?		
d	How many books do the class students read in a year?		
e	What is the name of your school?		
f	Do you like the red color?		
g	How many emails do students write?		
h	How many books have you read in the last year?		

Types of Statistical Questions

- The type of statistical question is determined by the type of data we get from answering these questions.



Practice 2 Determine whether the results from each question would give you **numerical data** or **categorical data**.

	Question	Numerical Data	Categorical Data
a	How many letters are there in the first name of each student in your class?		
b	What are the favorite colors of the students in your class?		
c	What kinds of films do the students in your class like?		
d	What color are the eyes of the students in your class?		
e	How many people do each of the students in your class have in their families?		

f	What television programs do the students in your class prefer?		
g	What are the scores of all your math tests during the current evaluation period?		
h	How many pets do the pupils in your class have?		



10

1 Complete the following:

- The types of questions are questions and questions.
- The types of statistical data are data and data.
- The numerical data is written in the form of
- The categorical data is written in the form of
- "What color are the pupils' eyes in your class?"
is a question. (statistical / non-statistical)

2 Choose the correct answer:

- are categorical data.
(Dates of birth or Ages or Weights or Favorite colors)
- are numerical data.
(Salaries or Favorite sports or Eye colors or Nationalities)
- All the following data are categorical, except
(birth places or lengths or names or colors)
- All the following data are numerical, except
(types of pets or test scores or ages or number of pets)
- "What is your weight?" is a question.
(numerical statistical or categorical statistical or non-statistical)

2&3 Lessons

Exploring the Histogram Representing Data Using Histograms

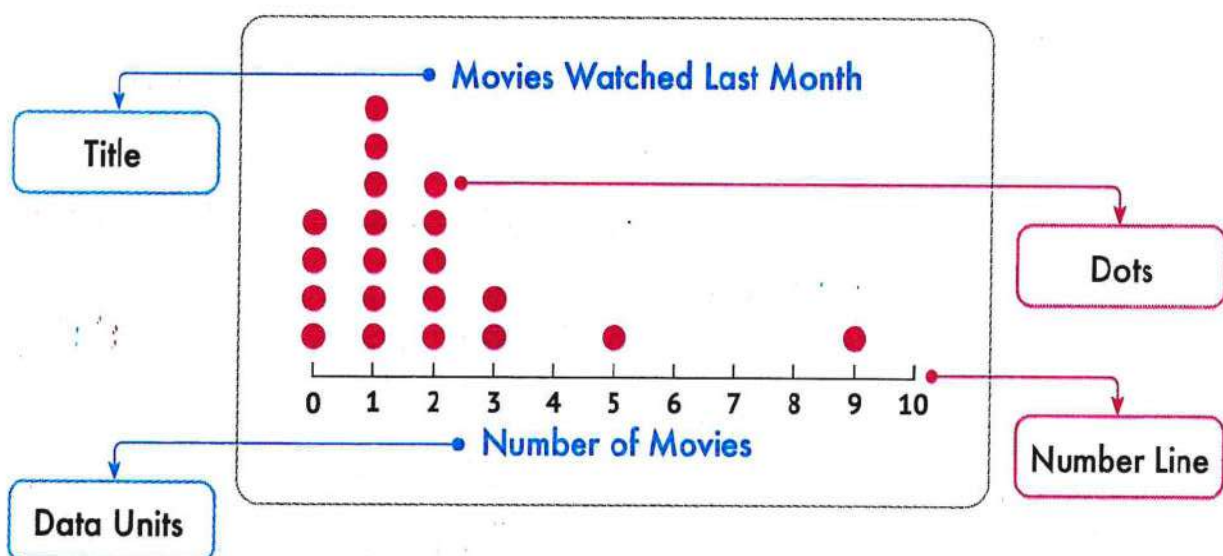
Dot Plot

- It is used to represent repeated numerical data on a **horizontal** number line.

Characteristics that all dot plots share:

- Titles**
- The data is graphed above a **number line**.
- Each individual piece of data can be seen on a **dot plot** and is represented by a **dot**.
- The number lines in dot plots should be labeled with the **units** used to measure the **data**.

Example: The following **dot plot** represents the number of movies that **20** people watched last month:



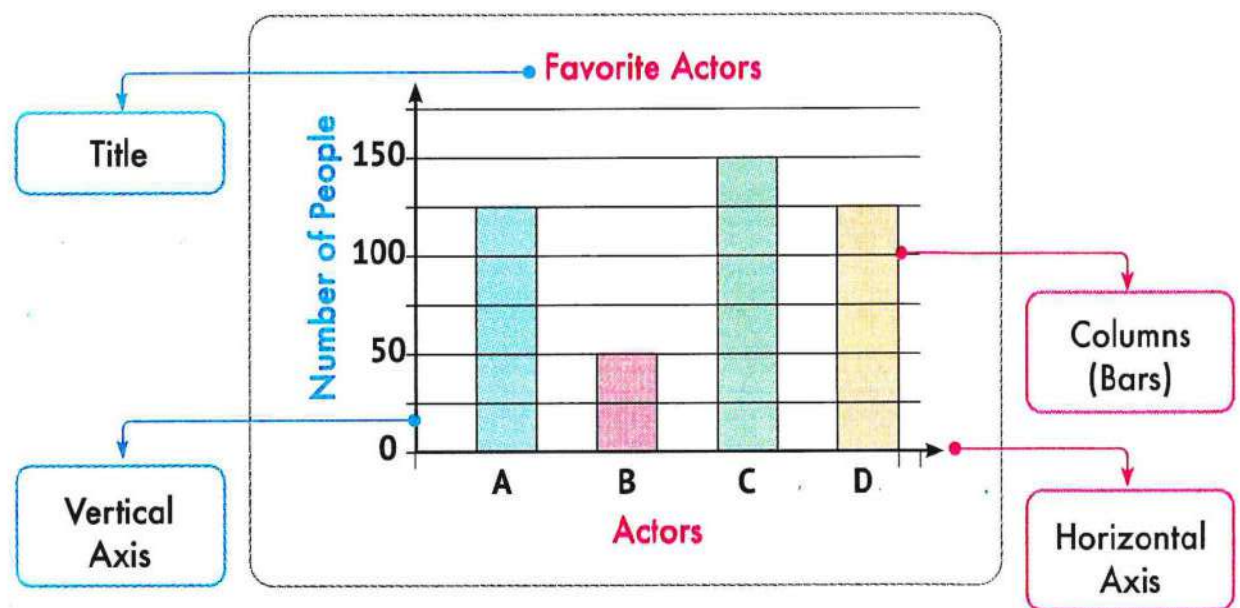
Bar Graph

- It is used to represent **categorical** and **numerical data**.

Characteristics that all bar graphs share:

- Titles**
- Two axes:**
 - A **horizontal axis** to represent data, which can be anything.
 - A **vertical axis** that has a scale.
- Labels** for each axis
- They show **categorical** data.
- The **bars** represent data.
- Each bar represents one **category** or one **value**.
- There are **equal gaps** between the bars.
- The bars **can** be **rearranged**.

Example: The following **bar graph** shows the preferred actors of a number of people:



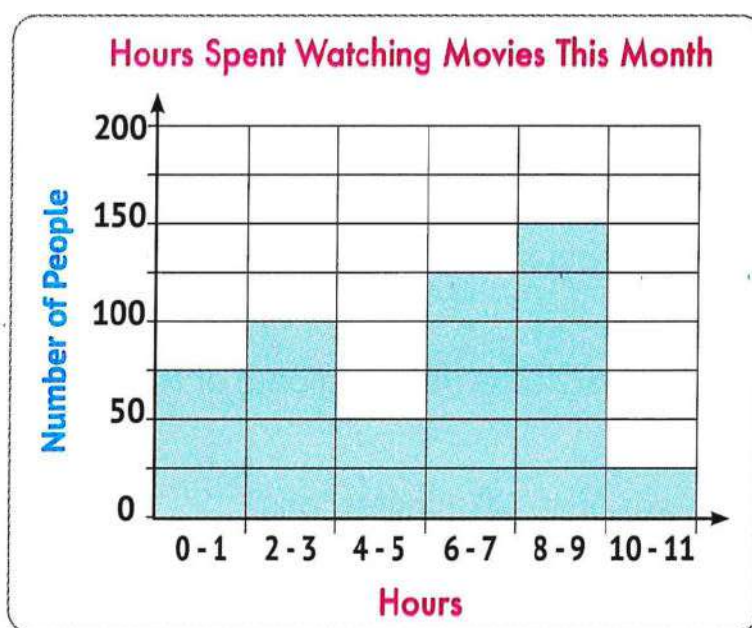
Histogram

- It is used to represent **numerical data** only.

Characteristics that all histograms share:

- **Titles**
- Two **axes**:
 - A **horizontal axis** to represent data, which can be anything.
 - A **vertical axis** that has a scale.
- **Labels** for each axis
- They show **numerical data**.
- The **bars** represent data.
- There are **no gaps** between the bars [unless data are not given in a specific interval].
- The bars should not **overlap**.
- The bars **cannot** be **rearranged**.

Example: The following **histogram** represents the number of hours spent watching movies by a number of people:



Comparing Bar Graphs and Histograms

Bar Graph

- It can show categorical and numerical data.
- Each bar represents one number, one number interval, or one category.
- It requires equal spaces between each bar or a different color for each bar.

Histogram

- It displays numerical data.
- Each bar represents an interval.
- There is no space between the bars unless there is no data for a particular interval.

Both of Bar Graphs and Histograms

- Have horizontal and vertical axes.
- Can display numerical data.
- Have titles and labels for both axes.
- Need a scale for the vertical axis.
- Use bars to represent data.

Practice 1

What is the **best graph** for the following situations?

(Bar graph) or (Histogram)

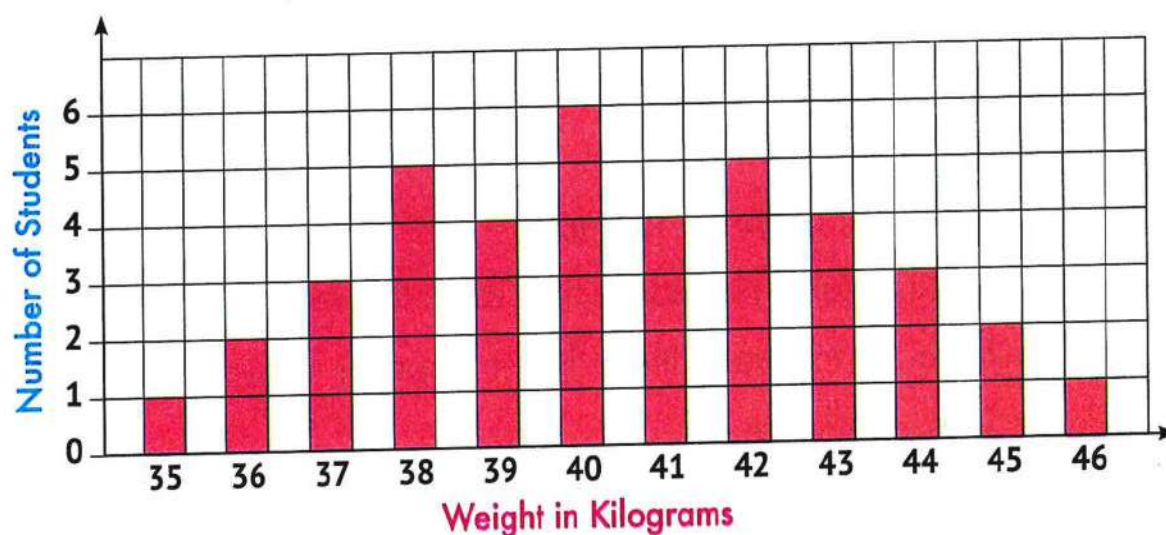
- a How many students got grades between **80** and **89** on the final exam?
(.....)
- b What are all the students' heights rounded to the nearest centimeter in your class?
(.....)
- c What are the favorite colors of the students in your class?
(.....)
- d What are the math test scores for the month of November?
(.....)
- e How many films are **60** to **80** minutes long?
(.....)
- f What is the number of amusement park visitors during the week days?
(.....)

Creating Histograms to Represent Data

Example: The following frequency table shows the weights of the students in a class of 40 students.

- It can be represented graphically by a bar graph, as follows:

Weight in Kilograms	35	36	37	38	39	40	41	42	43	44	45	46
Frequency (Number of Students)	1	2	3	5	4	6	4	5	4	3	2	1



To create a histogram to display the previous data:

- This data must be placed at suitable intervals, as follows:

1 Choose an **interval size** that makes sense for this data set.

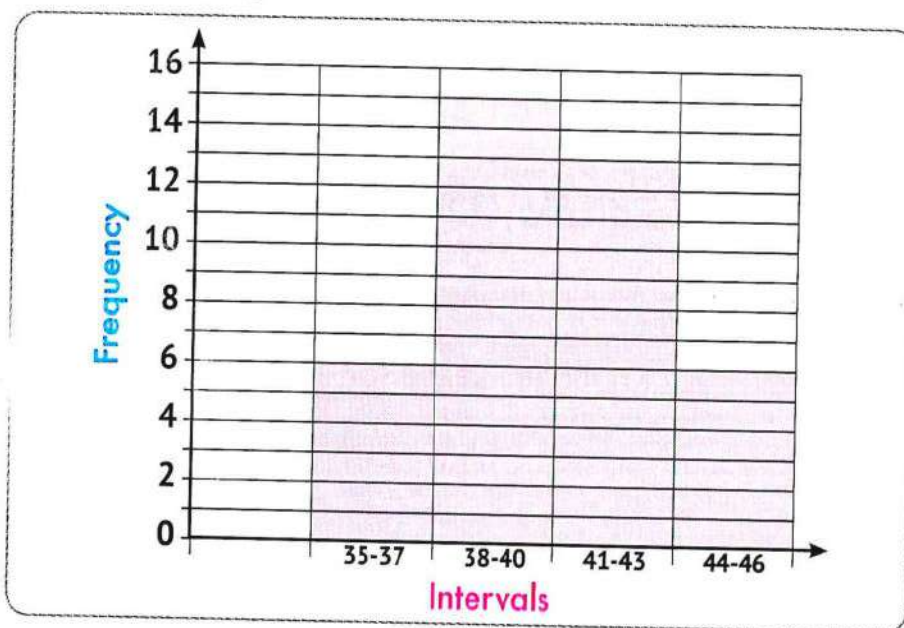
So that each interval consists of 3 items, and therefore the number of intervals is (4).

2 Compile the previous frequency table, as follows:

Weight in Kg	Frequency		Intervals	Frequency
35	1	→	35 – 37	6
36	2			
37	3			
38	5	→	38 – 40	15
39	4			
40	6			
41	4	→	41 – 43	13
42	5			
43	4			
44	3	→	44 – 46	6
45	2			
46	1			

To create a histogram using the previous frequency distribution table:

- On the horizontal axis, place the **intervals**.
- On the vertical axis, place the frequencies. Label this axis "**Frequency**".
- Draw a **bar** for each interval without leaving spaces between these bars as shown in the following figure.



Example:

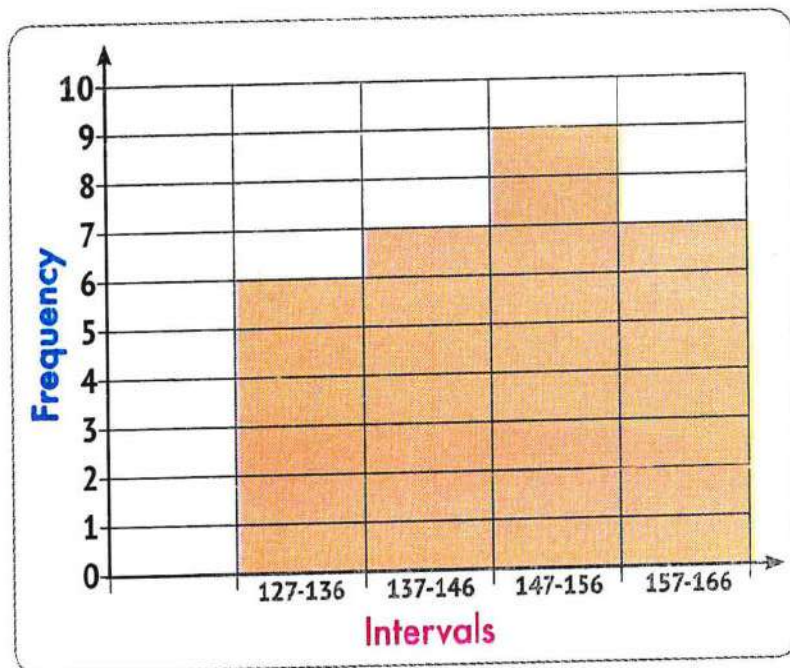
The following frequency table shows the data collected by the students. Draw a **histogram** showing this data. Make sure to choose an appropriate interval for this data set:

Arm Span (cm)	Frequency
127	2
132	3
135	1
138	1
141	1
142	2
143	1
144	2

Arm Span (cm)	Frequency
147	2
149	2
152	3
153	2
157	2
158	3
160	1
166	1

- From the previous table, we make a table of intervals where the length of the interval is 10 items.

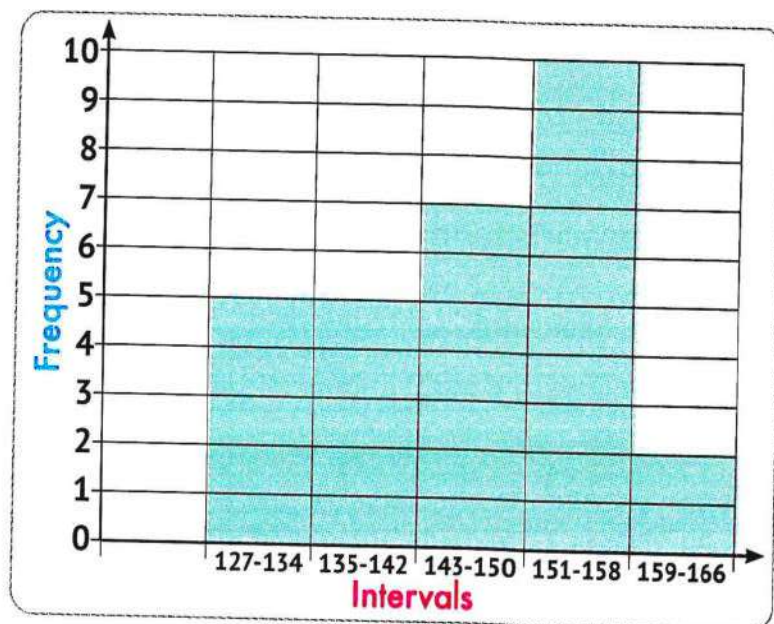
Intervals	Frequency
127 - 136	6
137 - 146	7
147 - 156	9
157 - 166	7



Unit 6 | Data Distributions

- In the intervals of length 8 items can be created.

Intervals	Frequency
127 - 134	5
135 - 142	5
143 - 150	7
151 - 158	10
159 - 166	2



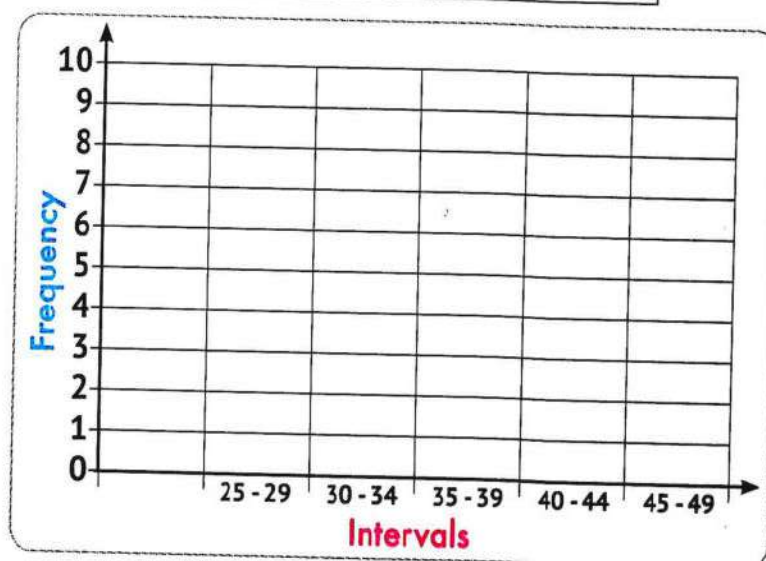
Practice 2

The following frequency table shows the grades obtained by 32 students in mathematics in the first semester:

Grades	Frequency
25	3
26	1
28	3
30	1
32	2
34	1
35	1
36	2
38	1

Grades	Frequency
39	2
40	1
42	3
44	1
45	3
46	1
47	1
48	3
49	2

Intervals	Frequency
25 - 29	
30 - 34	
35 - 39	
40 - 44	
45 - 49	



Quiz?

10

1 Match each of the following situations with the **best graph** to represent it:

a How many students do their families consist of 4 people?

Histogram 1

b How many sixth-grade students are there in your school classes?

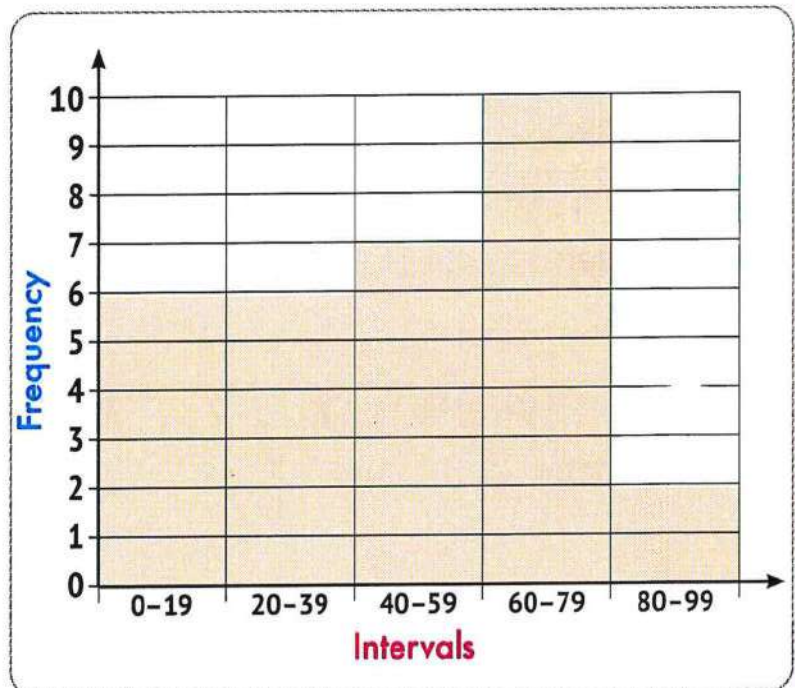
Dot Plot 2

c How many students in your class are 130 – 150 cm tall?

Bar Graph 3

2 Use the following **histogram** to complete the **interval table**:

Intervals	Frequency
0 – 19	
20 – 39	
40 – 59	
60 – 79	
80 – 99	



4

Lesson

Exploring Box Plot

The Median

- It's the value of the element appearing at the **middle** of the data set when the data are arranged in order (an **ascending order** or a **descending order**).
- If the data set has an **even number of values**, then the median is **half** the **sum** of the **two values** at the **middle**.

For example: Write the median for each of the following data sets:

a 3, 5, 8, 3, 7

The order: 3, 3, 5, 7, 8

Median: 5

b 7, 9, 3, 4, 4, 6

The order: 3, 4, 4, 6, 7, 9

Median: $(4 + 6) \div 2 = 5$

Practice 1

Find the **median** for each of the following data sets:

a 5, 9, 9, 2, 4

The order: , , , ,

Median:

b 2, 0, 5, 8, 11, 7

The order: , , , , ,

Median:

c 3, 9, 1, 8, 2, 3, 6

The order: , , , , , ,

Median:

d 2, 0, 5, 8, 11, 6, 5, 7

The order: , , , , , , ,

Median:

Box Plot

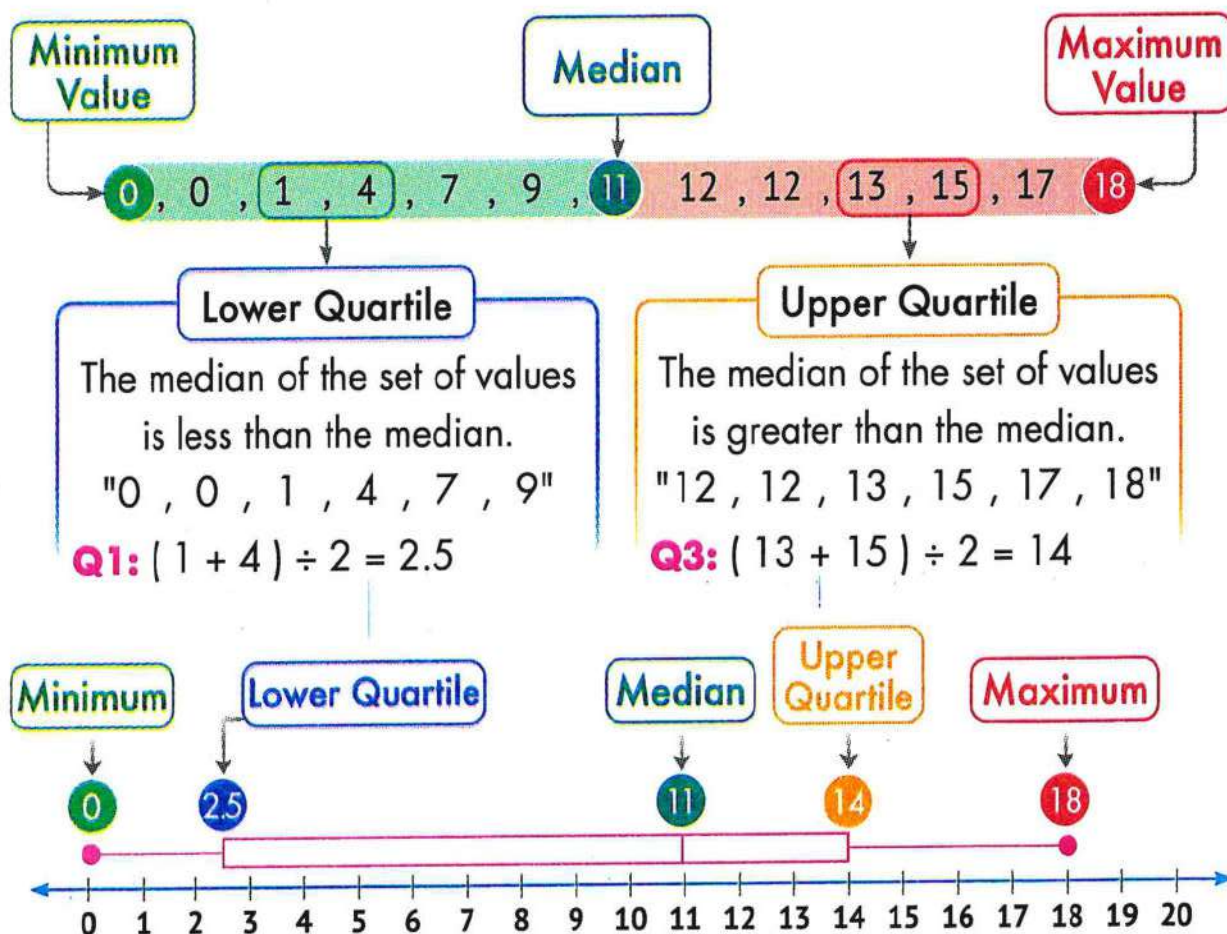
- It's a data display that represents numerical data based on a **5-point summary** of the data set.

- The minimum value
- The first quartile (Q1) or (Lower Quartile)
- The second quartile (Q2) or (Median)
- The third quartile (Q3) or (Upper Quartile)
- The maximum value

Example: Draw a box plot to represent the following values:

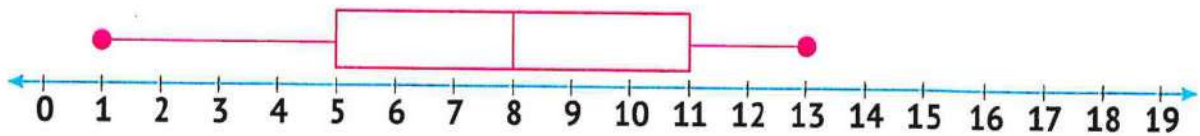
15, 17, 13, 11, 12, 9, 0, 12, 18, 4, 7, 1, 0

- To draw a box plot for the set of displayed values, the 5-point summary must be specified after arranging this data in an ascending order.



Practice 2

Using the following **box plot**, identify the **5-point** summary of the data set:



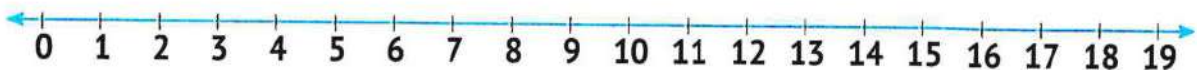
- a Minimum Value: b Lower Quartile:
 c Median: d Upper Quartile:
 e Maximum Value:

3 Draw the **box plots** for each of the following groups of values:

- a 2, 7, 10, 0, 2, 5, 6, 6, 12, 1

The order:

- 1 Minimum Value: 2 Lower Quartile:
 3 Median: 4 Upper Quartile:
 5 Maximum Value:



- b 4, 6, 1, 2, 0, 5, 4, 2, 8, 9, 7, 8, 3, 7

The order:

- 1 Minimum Value: 2 Lower Quartile:
 3 Median: 4 Upper Quartile:
 5 Maximum Value:



Quiz?

10

1 For the set of values: 3 , 11 , 7 , 2 , 3 , 8 , 7 , complete:

The order:

a Minimum Value:

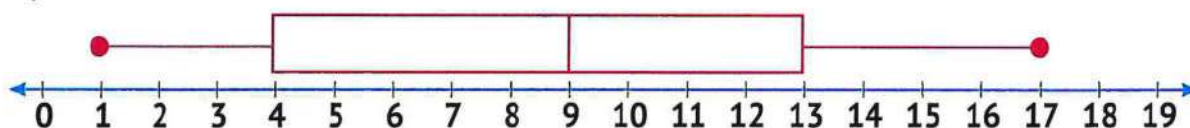
b Lower Quartile:

c Median:

d Upper Quartile:

e Maximum Value:

2 Using the following box plot, identify the 5-point summary of the data set:



a Minimum Value:

b Lower Quartile:

c Median:

d Upper Quartile:

e Maximum Value:

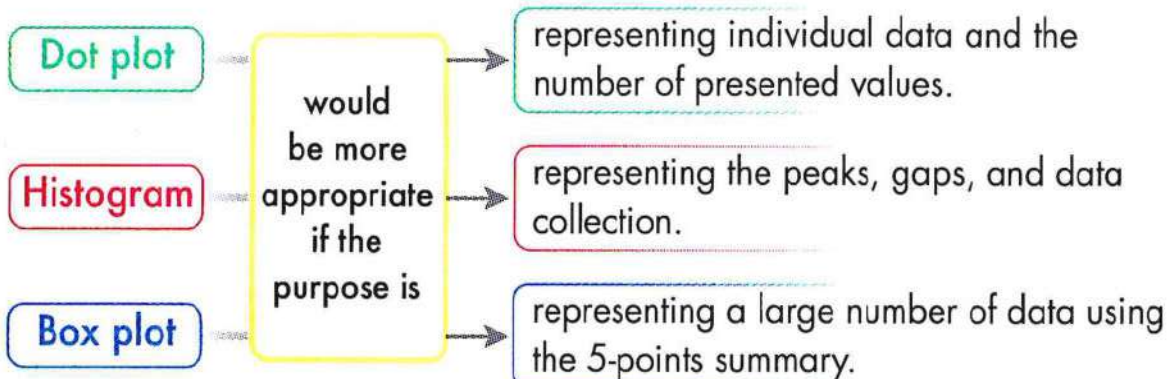
5

Lesson

Applications on Data Representations

Dot Plot - Histogram - Box Plot

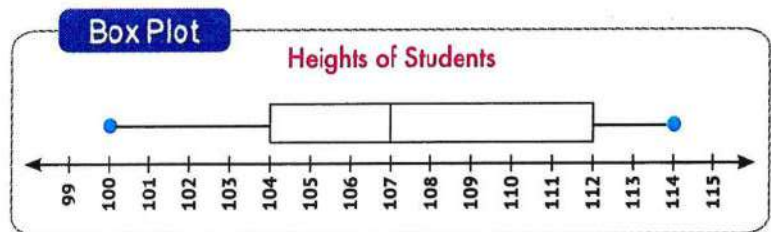
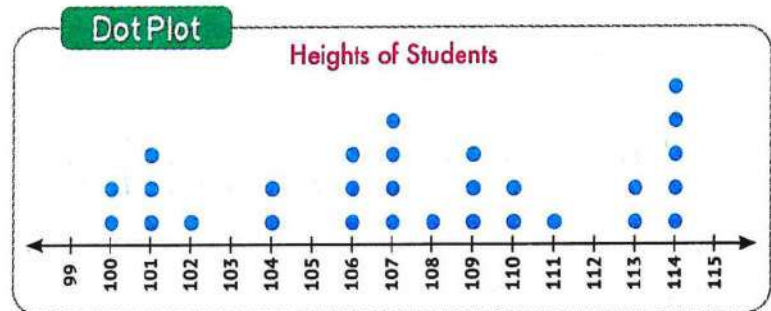
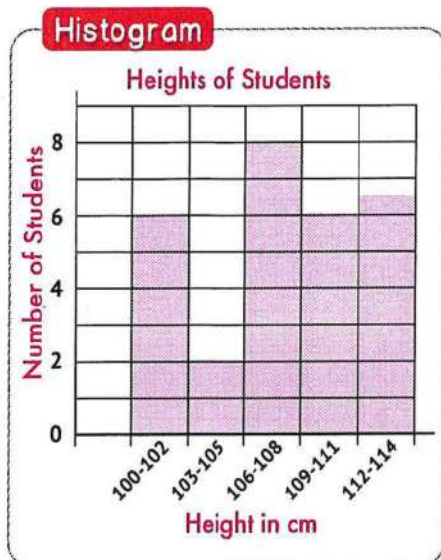
- Each of them is suitable for representing **numerical data**. To choose the most appropriate graph for a set of data, the **purpose** of using the graph must be determined.



Examples of statistical questions that can be answered using the above representations:

The question is about the	Dot Plot	Histogram	Box Plot
a Total number of values represented	✓	✓	
b Number of times each value is repeated	✓		
c Most frequent value	✓		
d Least frequent value	✓		
e Number of repetitions of values in a specified period	✓	✓	
f Number of repeated values for a set of periods	✓	✓	
g Gaps	✓	✓	
h Maximum value	✓		✓
i Minimum value	✓		✓
j 5-point summary	✓		✓
k Median	✓		✓

Ex. The following graphs represent the heights of a number of students rounded to the nearest centimeter.



Dot plot

- It shows the number of students and the height of each student accurately.
- The tallest student is **114** cm tall and the shortest is **100** cm.
- The most frequent height is **114** cm.

Histogram

- It shows that the tallest students range in height is from **112** cm to **114** cm.
- It shows that the least frequent heights are from **103** cm to **105** cm.
- It shows that the most common heights are from **106** cm to **108** cm.

Box plot

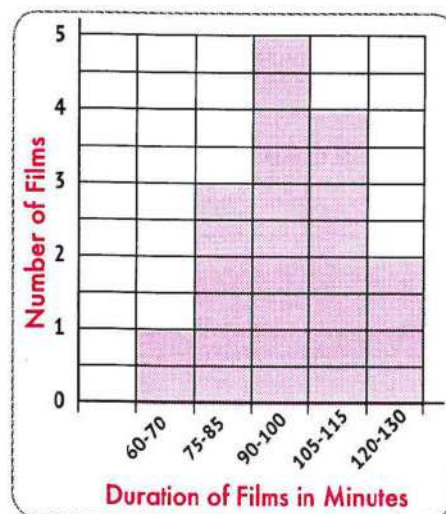
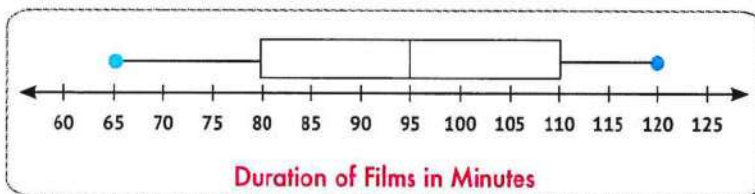
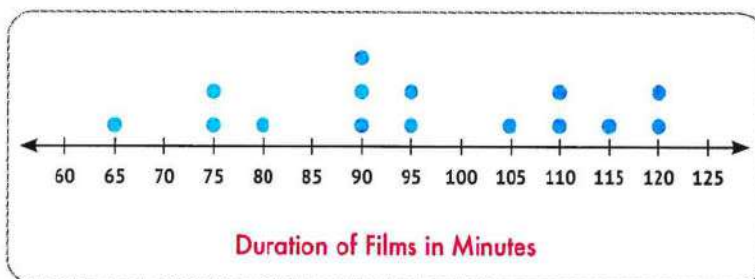
- It shows that the shortest student is **100** cm tall and that the tallest student is **114** cm tall.
- The median is **107**, the first quartile is **104**, and the second quartile is **112**.

NOTE

- There are questions that can only be answered through one of the previous graphs (dot plots), and other questions that can be answered through the other two graphs, and some questions can be answered through the three graphs.

Practice

The following graphs show the **duration** of showing a **number of films** in minutes:



a Answer the following questions and determine the graph that helps you with the answer:

	Question	Answer	Graph		
			Dot Plot	Histogram	Box Plot
1	How many films are their duration graphically represented?				
2	What is the duration of the longest film?				
3	How many movies are exactly 100 minutes long?				
4	How many movies are less than 90 minutes long?				
5	How many movies are from 105 to 115 minutes long?				
6	What is the median?				
7	How long are the most popular films?				

b Write **one question** that would be better to answer using:

- 1 A dot plot:
- 2 A histogram:
- 3 A box plot:

Quiz?

10

1 Match each **statistical question** with the **best graph** that can be used to answer it:

a What is the most frequent value?

Histogram

1

b What is the most frequent interval?

Box plot

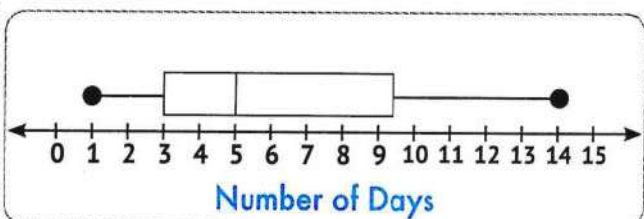
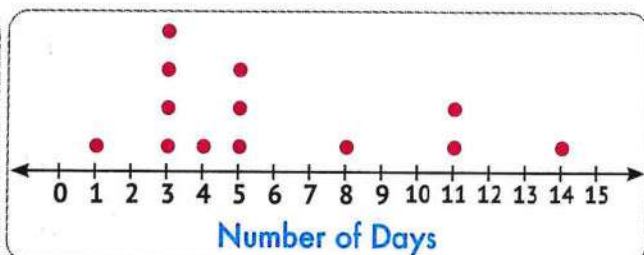
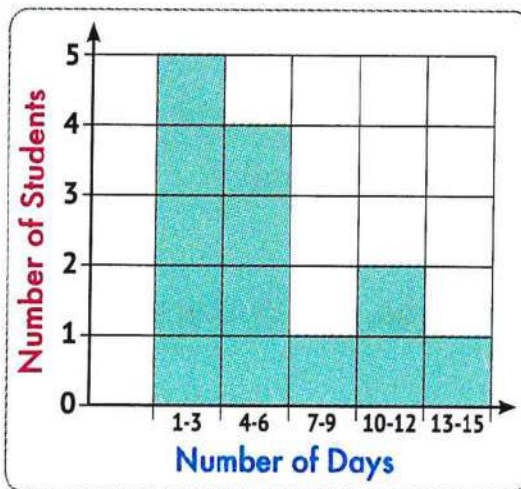
2

c What is the upper quartile?

Dot plot

3

2 The following graphs show the number of days in which a group of students were absent:



Write **two questions** that would be better to answer using:

a A dot plot:

1

2

b A histogram:

1

2

c A box plot:

1

2

Unit

7

Measures of Central Tendency and Spread

Concept 7.1

Exploring Measures of Central Tendency and Spread

Lessons

1&2

Exploring the Balance of Data Sets Interpreting Arithmetic Mean

Learning Objectives:

By the end of these lessons, the student will be able to:

- Summarize the data in a data set using a single number.
- Explore mean as a fair share.
- Determine an algorithm for calculating the mean of a data set.

Lesson

3

Exploring Median, Mode, and Outliers

Learning Objective:

By the end of this lesson, the student will be able to:

- Determine how outliers and the shape of a graph can help to determine whether the mean or median is a better measure of center.

Lesson

4

Exploring the Range

Learning Objective:

By the end of this lesson, the student will be able to:

- Define and calculate the range of data sets to provide an introduction to the importance of measures of variability.

1&2 Lessons

Exploring the Balance of Data Sets Interpreting Arithmetic Mean

- **Measures of central tendency (center)** are a group of measures that describe a **gathering point** around **central values**. General measures of central tendency are the **mean**, **median**, and **mode**.

- **The mean** is a numerical value that represents the **average** of a set of values.

Ways to Find the Mean of a Set of Numerical Values

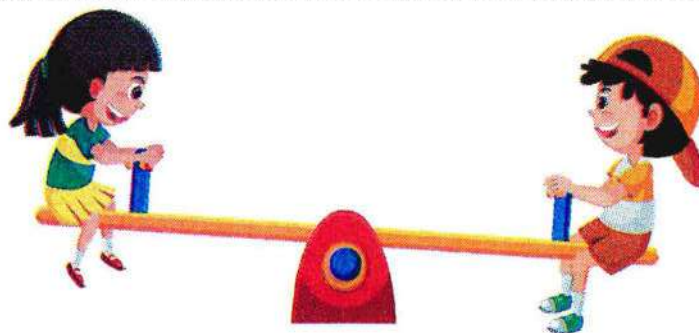
First: Finding the Mean by Finding the Balance Point

The Value of the Center of a Set of Data

- When representing data graphically using a dot plot graph, the **mean** of a set of data is the value of the **balance point** of that set of data.

● Balance point (the center of a set of data)

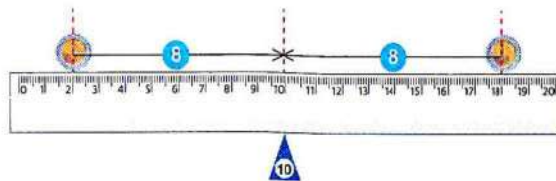
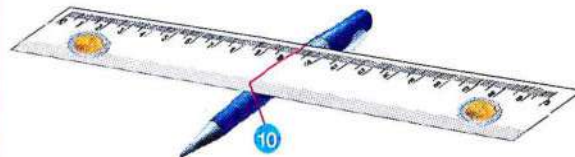
- It is a point on a number line or in a numerically ordered data set **where** the values are balanced on both sides.



Balance Game

- Bring a ruler (20 cm), some coins, and a pen.
- Put a coin at number (2) and another coin at number (18) on the ruler and move it over the pen until it becomes balanced, as shown in the pictures.
- **Notice** the position of the pen at which the ruler is balanced.

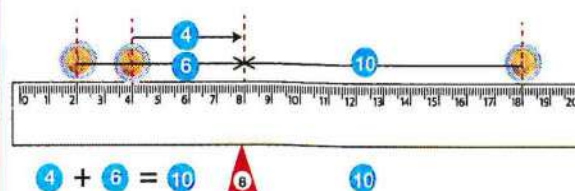
You find it on number 10, which is the balance point.



So, the mean of the two numbers 2 and 18 is 10.

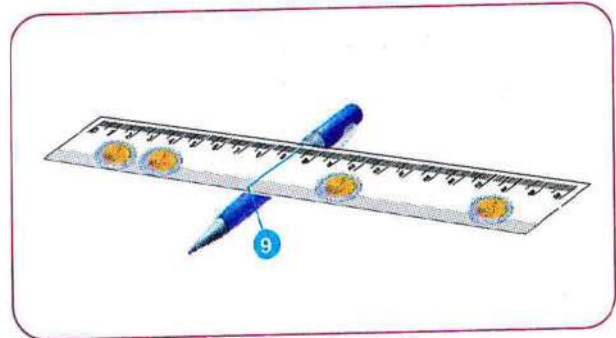
- Add another coin at number (4) on the ruler and move it over the pen until it becomes balanced, as shown in the pictures.
- **Notice** the position of the pen at which the ruler is balanced.

You find it on number (8), which is the balance point.



The mean of the numbers (2, 4, and 18) is 8.

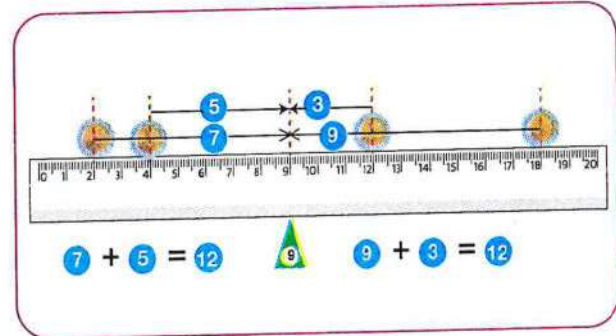
- Add another coin at number (12) on the ruler and move it over the pen until it becomes balanced, as shown in the pictures.



- **Notice** the position of the pen at which the ruler is balanced.

You find it on number (8), which is the **balance point**.

You also find it on number (10), which is the **balance point**.



The mean of the numbers 2, 4, 12, and 18 is 9.

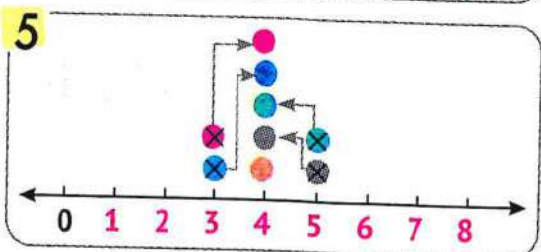
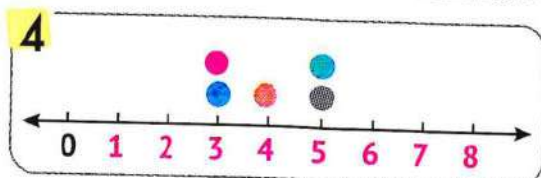
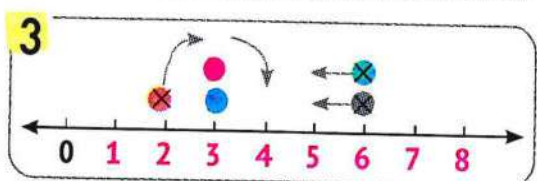
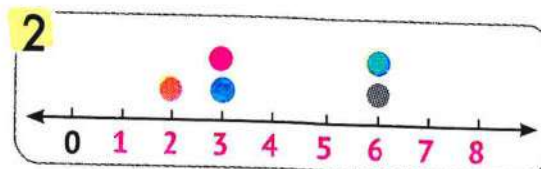
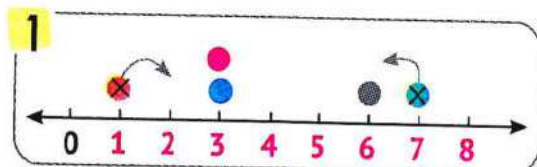
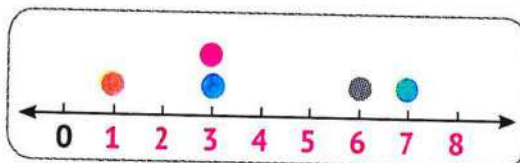
Repeat the game, add more coins, and notice the change in the balance points with the change in the positions of the coins.

NOTE

- If we add the distances between the numbers and the mean (the **balance point**) on each side, each time we find that the sum of these distances is always equal on both sides (**balanced**).

Example:

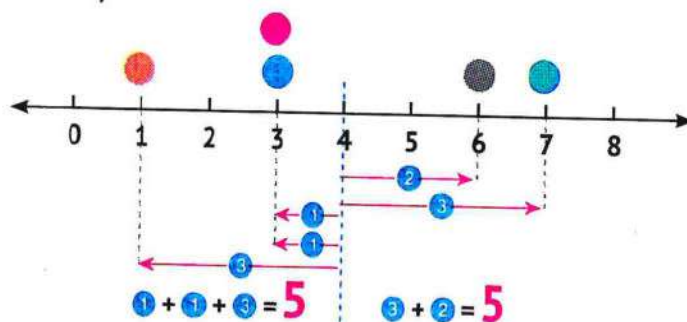
Determine the **mean (balance point)** for the data represented using the following dot plot:



Notice that:

- Moving one point in two steps is equivalent to moving two points in one step.
- The number at which all points congregate is the center of this set of data.
- The mean is 4.

When **adding** the **distances** between the points and the **mean** from both sides, they must be **equal (balanced)**.

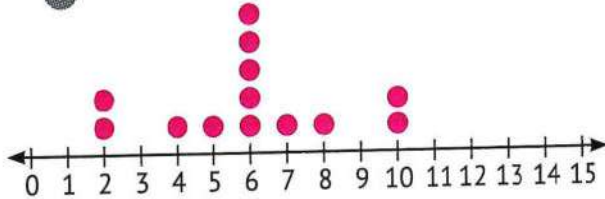


From the foregoing, we find that the data center represented by the previous point chart is number 4.

That is, the mean of the numbers 7, 6, 3, 3, and 1 is 4.

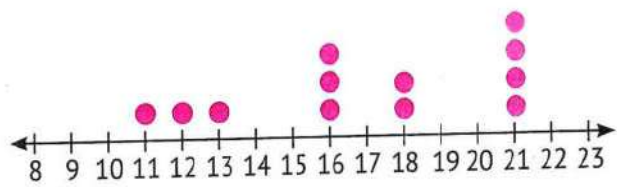
Practice 1 Determine the **mean** (the center of the data set) for each of the following graphs:

a



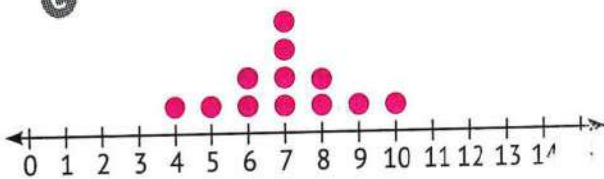
• Mean =

b



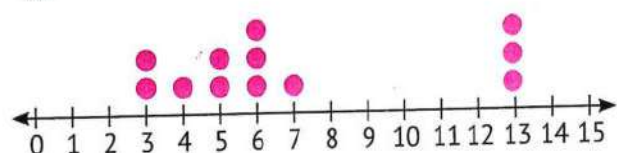
• Mean =

c



• Mean =

d

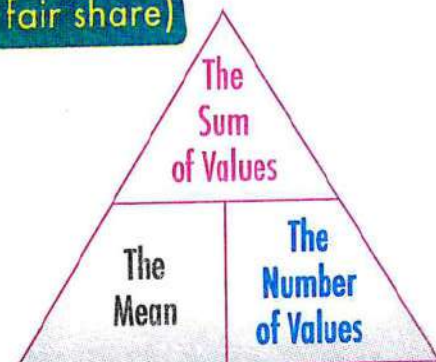


• Mean =

Second: The Mean Algorithm (the mean as a fair share)

$$\text{The Mean} = \frac{\text{The Sum of Values}}{\text{The Number of Values}}$$

$$\text{The Number of Values} \times \text{The Mean} = \text{The Sum of Values}$$



Example: A group of students each owns a certain number of pens, as shown in the table:

Student	Mahmoud	Saleh	Hady	Mark	Nader
Number of Pens	6	7	2	3	7

- These students collected their pens together and redistributed them equally among themselves, so each of them had a share of:

$$\frac{6 + 7 + 2 + 3 + 7}{5} = \frac{25}{5} = 5 \text{ Pens}$$

NOTE

- The redistribution has been made so that each of them has the same share, and this is the **mean**.

Practice 2 A group of friends collected their marbles and redistributed them **equally** among themselves. The following table shows the number of marbles that each of them owns.

Child	Sajid	Marwan	Fatima	Farida	Wafaa	Omar
Number of Marbles	8	9	12	7	3	9

Find the **share** of each of them after redistributing the marbles equally.

Example: Find the **mean** of the values: 4, 11, 16, and 20

$$\text{Mean: } \frac{4 + 11 + 16 + 20}{4} = \frac{51}{4} = 12 \frac{3}{4}$$

Practice 3 Find the **mean** for the following values:

a 40, 38, 36, 34, and 32

$$\begin{aligned} \text{Mean} &= \dots\dots\dots \\ &= \dots\dots\dots \end{aligned}$$

b 25, 12, 3, and 18

$$\begin{aligned} \text{Mean} &= \dots\dots\dots \\ &= \dots\dots\dots \end{aligned}$$

c 3, 3, 5, 7, 2, 4, 7, and 3

$$\begin{aligned} \text{Mean} &= \dots\dots\dots \\ &= \dots\dots\dots \end{aligned}$$

d 52, 98, and 60

$$\begin{aligned} \text{Mean} &= \dots\dots\dots \\ &= \dots\dots\dots \end{aligned}$$

Example:

If the mean of the values: 6, 7, x , and 3 is 5, find the value of x .

Solution The mean $\times$ The number of values = The sum of the values

$$6 + 7 + x + 3 = 4 \times 5$$

$$x + 16 = 20 \longrightarrow \boxed{x = 4}$$

Another Solution

$$\begin{aligned} \text{Value of } x &= (\text{The number of values} \times \text{The mean}) - \text{The sum of the given values} \\ &= (4 \times 5) - 16 \\ &= 20 - 16 = 4 \end{aligned}$$

Practice 4 Find the value of x in each of the following:

- a If the mean of the values 6, x , 7, 9, 7, and 8 is 7.

.....

.....

- b If the mean of the values x , 5, 4, 9, and 8 is 6.

.....

.....

Quiz?

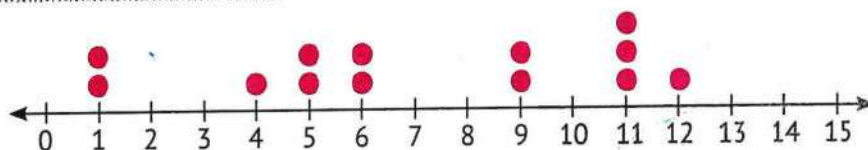
10

1 Choose the correct answer:

- a The mean of the values 45 , 15 , 40 , 70 , and 80 is
(40 or 45 or 50 or 60)
- b If the mean of the values 12, 15, x , and 8 is 10, then the value of x is
(40 or 5 or 20 or 10)
- c If the sum of 8 values equals 48, then the mean of these values is
(40 or 56 or 24 or 6)
- d If the sum of a set of values is 36, and the mean of these values is 6, then the number of these values is
(6 or 42 or 30 or 216)
- e If the mean of 9 values is 5, then the sum of these values is
(45 or 14 or 4 or 95)

2 Determine the **mean** for the following graph:

Mean:



3

Lesson

Exploring Median, Mode, and Outliers

The Mode

- The mode of a set of data is the **most common (frequent) value** in the set.

Some values might have

Only one mode

Example:

- The values (5, 8, 5, 5, 6, 8, and 5) have one mode, which is **5**.

Because

only 5 is the most frequent number.

More than one mode

Example:

- The values (6, 5, 8, 6, 5, 7, 5, and 6) have two modes, which are **5** and **6**.

Because

each of 5 and 6 are the most frequent numbers.

No mode

Example:

- The values (8, 3, 9, 5, 4, 2, 10, and 0) **do not have** a mode.

Because

no value is repeated more than the others.

NOTE

- The mode can be found for a set of categorical data.

Example: The mode of the values (red, green, yellow, red, and blue) is **red**.

Practice 1 Find the **mode** for each of the following set of values:

	Values	Mode
a	6, 8, 3, 8, 5, 8, 3	
b	7, 1, 2, 7, 6, 4, 3, 5	
c	Car, plane, bus, bike, plane	
d	2, 3, 2, 7, 8, 2	
e	Orange, banana, grape, tangerine, guava	
f	12, 15, 12, 10, 6, 7	
g	10, 13, 10, 13, 7, 2	

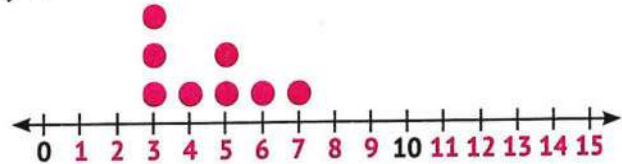
Outliers

- An outlier is an **extreme value** (high or low) that differs from most other values.

Examples:

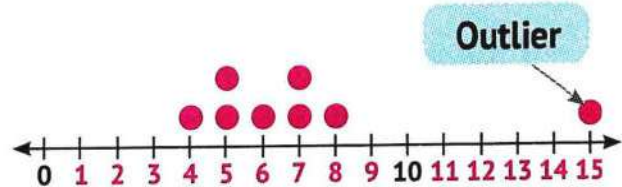
- a • Values: "6 , 3 , 7 , 5 , 3 , 5 , 4 , 3"

- There are **no** outliers.
- Because all values are close to each other.



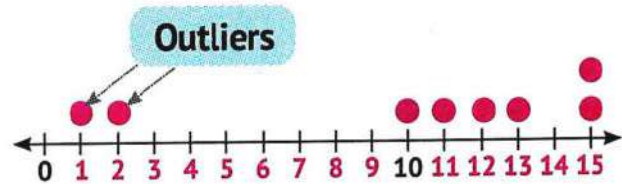
- b • Values: "7, 6, 5, 8, 7, 4, 15, 5"

- "15" is called an **outlier**.
- Because it is much higher than the other values.



- c • Values: "12 , 15 , 2 , 1 , 10 , 15 , 13 , 11"

- "1 and 2" are called **outliers**.
- Because they are less than the other values.



Practice 2 List the **outliers** in each of the following sets of values:

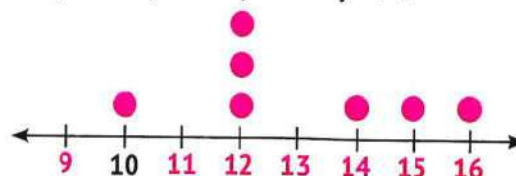
	Values	Outliers
a	6 , 8 , 7 , 5 , 19	
b	16 , 17 , 15 , 18 , 2	
c	3 , 2 , 5 , 6 , 4 , 5	
d	24 , 25 , 3 , 2 , 27 , 22	
e	122 , 118 , 120 , 119 , 124	
f	55 , 65 , 58 , 11 , 69	

Mean, Median, and Outliers

Note the following examples to see the effect of outliers when calculating the mean and median of a set of values.

Example: Set of values: "10 , 12 , 12 , 15 , 12 , 16 , 14"

The mean is 13,
and the median is 12.



In the previous example

- If the value 16 is replaced by another value, such as 56, then the set of values becomes: "10 , 12 , 12 , 15 , 12 , 58 , 14".

So, the mean: **19**, and the median: **12**

- If the value 10 is replaced by another value, such as 3, then the set of values becomes: "3 , 12 , 12 , 15 , 12 , 16 , 14".

So, the mean: **12**, and the median: **12**

NOTES

The mean is affected by the outliers in the data set.

The mean

increases if the outliers are greater than the other values.

decreases if the outliers are less than the other values.

The median is not affected by the outliers in the data set.

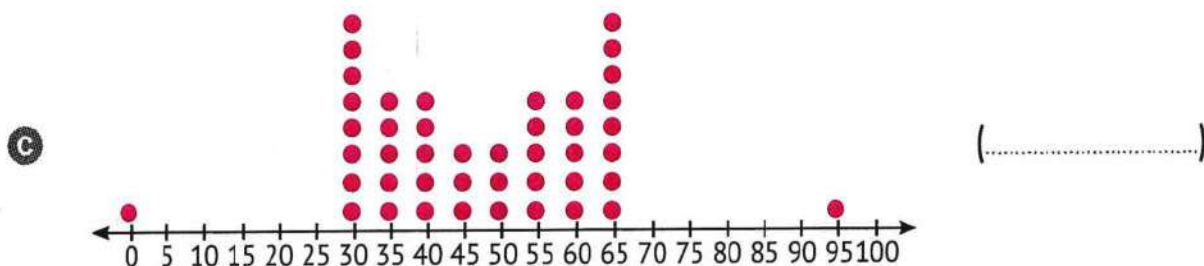
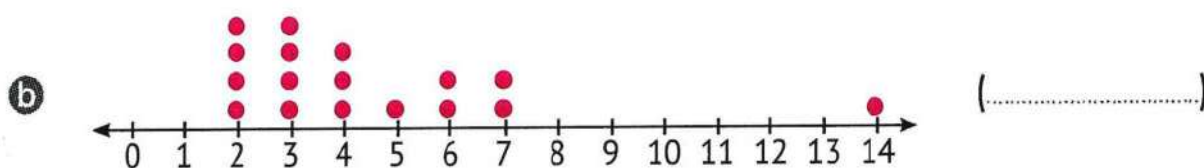
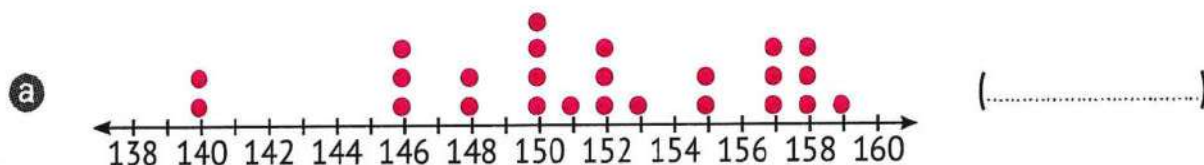
It is preferable to use:

- The **median** as a measure of the central tendency if the data has outliers at one side only.
- The **mean** as a measure of the central tendency if the data does not have outliers.

Practice 3

Use reasoning to assign each of the given descriptions to the related graph:

(Mean increases, Mean decreases, Mean stays the same)

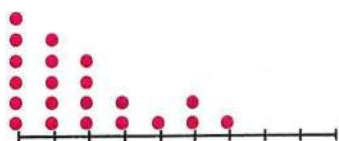


When representing data graphically using a dot plot:

if the graph is

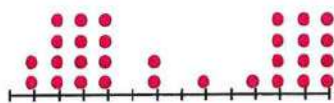
- skewed to one side, the **median** is the best choice as a measure of central tendency.

Example:



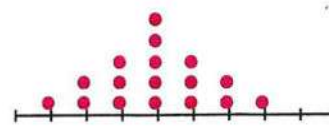
- evenly distributed, the **mean** is the best choice as a measure of central tendency.

Example:



- symmetrical, then either the **mean** or the **median** are suitable as measures of central tendency.

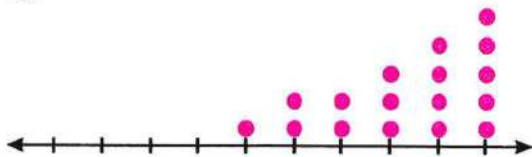
Example:



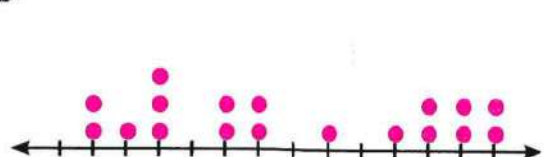
Practice 4

Choose the **measure of central tendency** that you think would be best used for each of the following graphs:
Mean, Median, or Either:

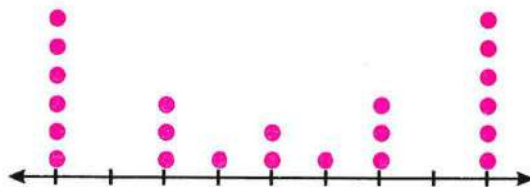
a



b



c



Quiz?

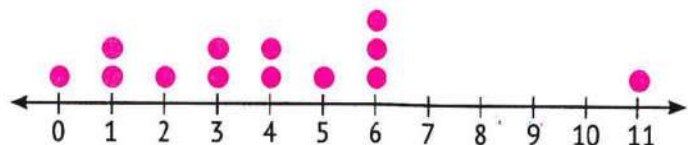
10

1 Choose the correct answer for the values (2, 6, 7, 23, 2, 1, and 8):

- a The mode is: (6 or 7 or 2 or 23)
- b The median is: (6 or 7 or 2 or 23)
- c The mean is: (6 or 7 or 2 or 23)
- d The outlier is: (6 or 7 or 2 or 23)
(45 or 14 or 4 or 95)

2 Using the following dot plot, complete:

- a The mode is: _____
- b The median is: _____
- c The mean is: _____
- d The outlier is: _____



- e The measure of center that you think would be best used for this graph is the (mean or median)

4 Lesson

Exploring the Range

• **Measure of variability** is a single value that indicates the spread of data in a set.

• **The range** of the data is the amount of spread among all the data collected.

$$\text{The Range} = \text{The Maximum Value} - \text{The Minimum Value}$$

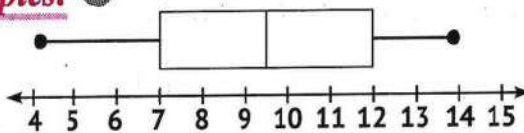
Example: The range for the set of values "6, 3, 7, 2, 9, 5" is $9 - 2 = 7$

NOTES

• It is easier to find the range using a dot plot or box plot.

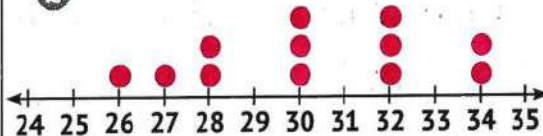
Because each of them shows the greatest value and the least value.

Examples: a



$$\text{Range} = 14 - 4 = 10$$

b



$$\text{Range} = 34 - 26 = 8$$

• **The histogram** does not show individual data points, and the data is aggregated into intervals. Therefore, the range cannot be found using a histogram.

• **The tables** can be trickier because the values are not ordered from smallest to largest.

Example: The following table shows Nour's scores in quizzes. What is the range score for her quizzes?

Quiz	1	2	3	4	5	6	7	8
Score	18	15	17	20	18	19	18	15

• **Lowest score:** 15

• **Highest score:** 20

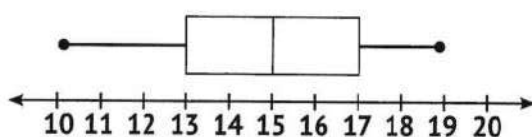
• **The range:** $20 - 15 = 5$

Practice 1 Find the **range** for each of the following set of values:

	Values	Range
a	6 , 3 , 5 , 9 , 2 , 2	.....
b	25 , 36 , 75 , 15 , 36 , 14	.....
c	9 , 25 , 78 , 6 , 14	.....
d	5 , 2 , 7 , 13 , 9 , 12	.....
e	55 , 40 , 12 , 11 , 45	.....

Practice 2 Use each of the following graphs to find the **range**:

a

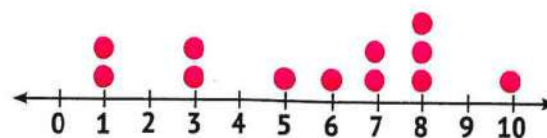


Largest value:

Least value:

Range:

b

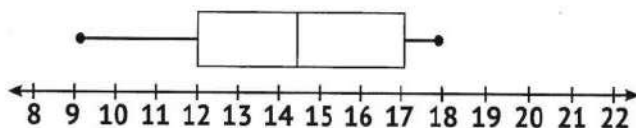


Largest value:

Least value:

Range:

c

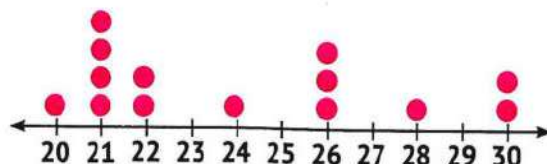


Largest value:

Least value:

Range:

d



Largest value:

Least value:

Range:

Practice 3 Find the **range** in each of the following:

- a The following table represents the temperatures recorded in one of the cities in a **week**.

Day	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Temperature	25°	28°	30°	22°	24°	26°	25°

- Largest value: • Least value: • Range:

- b The following table represents the number of hours Hatem spent studying for **5** days:

Day	First	Second	Third	Fourth	Fifth
Number of Hours	4	5	6	3	5

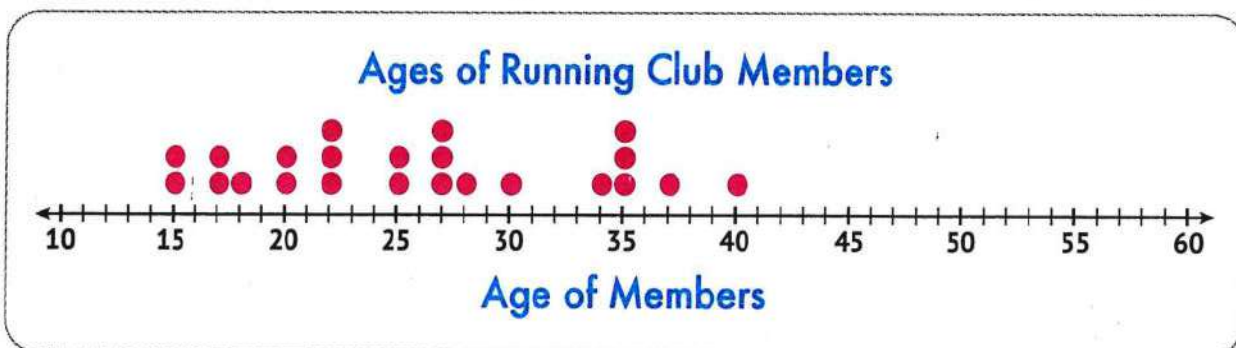
- Largest value: • Least value: • Range:

Outliers and Range

The range is affected by the outliers in the data set.

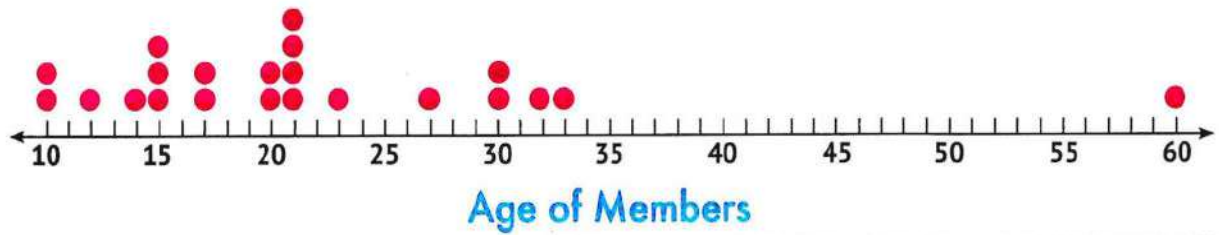
- Therefore, it is useful to know the measures of dispersion (**range**) in addition to the measures of the central tendency (**median**) when analyzing data in which there are outliers.

Example: This is the comparison of the two dot plots showing the ages of members in a running club versus the members of a hiking club:



- **Range:** $40 - 15 = 25$ • **Median:** 25
 • **Note that** the range accurately describes the data and that the age range is **25**.

Ages of Hiking Club Members



- **Range:** $60 - 10 = 50$
- **Median:** 20.5
- An outlier results in a larger range, but the majority of members have a shorter life span if the outlier is excluded.

So, the range is a good measure for the data when there are no outliers.

Quiz?

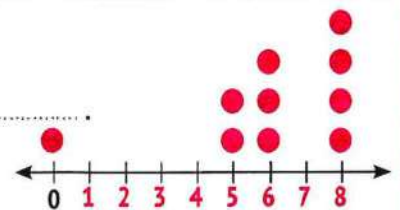
10

1 Choose the correct answer for the values (12 , 16 , 2 , 15 , 12 , 14 , 13):

- a The range is: (12 or 2 or 13 or 14)
- b The mode is: (12 or 2 or 13 or 14)
- c The median is: (12 or 2 or 13 or 14)
- d The mean is: (12 or 2 or 13 or 14)
- e The outlier is: (12 or 2 or 13 or 14)

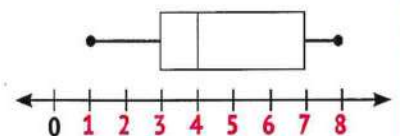
2 Use the opposite box plot to complete:

- a The range is: b The median is:
- c The outlier is:



3 Use the opposite dot plot to complete:

- a The range is:
- b The median is:



★ GUIDE ANSWERS ★



Theme 1

Unit 1

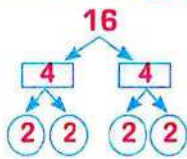
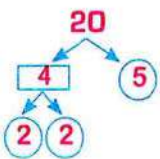
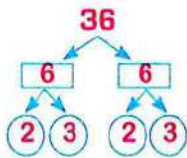
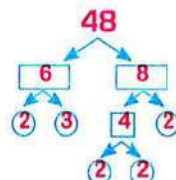
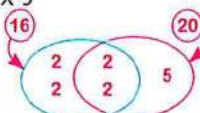
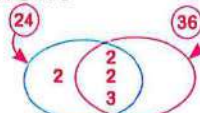
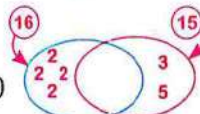
Lesson 1

- 1 a 8, 4, not divisible
b 8, 3, not divisible
c 4, 0, divisible
d 30, 0, divisible
e 5, 4, not divisible
f 3, 0, divisible
- 2 30, 54, 258, 212, 654, 26, 368, 6,530
- 3 45, 36, 456, 1,002, 558, 10,002
- 4 45, 250, 830, 945, 630, 2005
- 5 a 342, 250, 702, 600
b 342, 531, 315, 702, 600
c 335, 250, 315, 600
d 342, 702, 600
e 250, 600
- 6 a ✓, X, ✓, X, X, X
b ✓, ✓, ✓, X, ✓, X
c ✓, ✓, X, ✓, ✓, ✓
d ✓, ✓, X, X, ✓, X
e ✓, X, X, ✓, X, ✓
f ✓, ✓, ✓, ✓, ✓, ✓
g ✓, ✓, ✓, X, ✓, X

Quiz

- 1 a 1,026 b 6,900 c 836
- 2 a zero b 0, 5 c 6
d 12
e 15, 30, 45 (Many answers are accepted.)

Lesson 2

- 1 a  $16 = 2 \times 2 \times 2 \times 2$
b  $20 = 2 \times 2 \times 5$
c  $36 = 2 \times 2 \times 3 \times 3$
d  $48 = 2 \times 2 \times 2 \times 2 \times 3$
- 2 a $16 = 2 \times 2 \times 2 \times 2$, $20 = 2 \times 2 \times 5$
GCF = $2 \times 2 = 4$
LCM = $2 \times 2 \times 2 \times 2 \times 5 = 80$ 
b $24 = 2 \times 2 \times 2 \times 3$, $36 = 2 \times 2 \times 3 \times 3$
GCF = $2 \times 2 \times 3 = 12$
LCM = $2 \times 2 \times 2 \times 3 \times 3 = 72$ 
c $16 = 2 \times 2 \times 2 \times 2$, $15 = 3 \times 5$
GCF = 1
LCM = $2 \times 2 \times 2 \times 2 \times 3 \times 5 = 240$ 
- 3 a $9 = 3 \times 3$ $8 = 2 \times 2 \times 2$
GCF = 1 LCM = 72 (Yes)
b $15 = 3 \times 5$ $4 = 2 \times 2$
GCF = 1 LCM = 60 (Yes)
c $6 = 2 \times 3$ $8 = 2 \times 2 \times 2$
GCF = 2 LCM = 24 (No)
- 4 a The two numbers are 30 and 20.
b The common prime factors are 2 and 5.
c GCF = 10 d LCM = 60 e No

Quiz

- 1 a 2 b their product c 1
- 2 a $16 = 2 \times 2 \times 2 \times 2$
 $24 = 2 \times 2 \times 2 \times 3$
GCF = $2 \times 2 \times 2 = 8$
LCM = $2 \times 2 \times 2 \times 2 \times 3 = 48$
b 1 10 and 9 2 none 3 1
4 90 5 yes

Lesson 3

- 1 a 5, 3, 5, 6 b 7, 2, 4
c 9, 2, 8, 8 d 9, 4, 6
- 2 a 6 b $30 \div 6 = 5$ c $48 \div 6 = 8$
d $(6 \times 5) + (6 \times 8) = 6 \times (5 + 8)$
- 3 $(8 \times 3) + (8 \times 2) = 8 \times (3 + 2)$

Quiz

- 1 a 7, 5 b 4, 6, 2, 2
c 3 d 1 e 6, 8
- 2 a GCF = 3, the greatest number of groups is 3.
b GCF = 4
 $(4 \times 3) + (4 \times 2) = 4 \times (3 + 2)$

Lesson 4

- 1 a $\frac{9}{12} + \frac{5}{12} = \frac{14}{12} = \frac{7}{6} = 1 \frac{1}{6}$
b $\frac{7}{9} - \frac{3}{9} = \frac{4}{9}$
c $2 \frac{9}{24} + 1 \frac{20}{24} = 3 \frac{29}{24} = 4 \frac{5}{24}$
d $5 \frac{16}{18} - 3 \frac{9}{18} = 2 \frac{7}{18}$
e $8 \frac{3}{15} + 2 \frac{5}{15} = 10 \frac{8}{15}$
f $6 \frac{8}{12} - 2 \frac{3}{12} = 4 \frac{5}{12}$
- 2 a Number of hours = $2 \frac{3}{4} + 1 \frac{1}{2} + 1 \frac{1}{5}$
 $= 2 \frac{15}{20} + 1 \frac{10}{20} + 1 \frac{4}{20}$
 $= 4 \frac{29}{20} = 5 \frac{9}{20}$ hours
- b Galal paid = $5 \frac{1}{2} + 3 \frac{3}{4} + 2 = 5 \frac{2}{4} + 3 \frac{3}{4} + 2$
 $= 10 \frac{5}{4} = 11 \frac{1}{4}$ pounds
- c The amount left = $25 \frac{1}{2} - 16 \frac{1}{4}$
 $= 25 \frac{2}{4} - 16 \frac{1}{4} = 9 \frac{1}{4}$ pounds

- d The difference = $4 \frac{1}{2} - 3 \frac{1}{4} = 4 \frac{2}{4} - 3 \frac{1}{4}$
 $= 1 \frac{1}{4}$ hours

Quiz

- 1 a $5 \frac{1}{6} + 3 \frac{2}{6} = 8 \frac{3}{6} = 8 \frac{1}{2}$
b $9 \frac{2}{4} - 2 \frac{1}{4} = 7 \frac{1}{4}$
c $7 \frac{3}{4} - 3 \frac{2}{5} = 7 \frac{15}{20} - 3 \frac{8}{20} = 4 \frac{7}{20}$
d $7 \frac{1}{3} + 3 \frac{4}{5} = 7 \frac{5}{15} + 3 \frac{12}{15} = 10 \frac{17}{15}$
 $= 11 \frac{2}{15}$
- 2 a The total mass = $3 \frac{1}{2} + 4 \frac{1}{4}$
 $= 3 \frac{2}{4} + 4 \frac{1}{4} = 7 \frac{3}{4}$ kg
- b she has left = $12 - 3 \frac{1}{2} = 11 \frac{2}{2} - 3 \frac{1}{2}$
 $= 8 \frac{1}{2}$ meters

Unit 2

Lessons 1&2

- 1 a 25 b -3 c -10
d 12 e -19 f -4
- 2 Answer by yourself.
- 3 a -2 b 5 c -8
d 8 e -10 f 1
g -1 h 0
- 4 a < b > c <
d > e > f >
g > h = i =
- 5 a 7 b -6 c 15
d -12 e 0 f 45

Quiz

- 1 a 0 b -4 c 3
2 a -7 b -4 c <
3 The order : -6 , -3 , 0 , 3 , 6

Lessons 3&4

- 1 a $\frac{75}{100}$ b $-\frac{45}{1}$ c $\frac{4}{1}$
d $\frac{0}{8}$ e $\frac{16}{5}$ f $-\frac{15}{10}$
2 a does not belong b belongs
c does not belong d belongs
3 a not a subset b subset c subset
d not a subset
4 a ✓, ✓, ✓, ✓, Counting
b ✗, ✓, ✓, ✓, Natural
c ✗, ✗, ✓, ✓, Integer
d ✗, ✗, ✗, ✓, Rational
e ✗, ✗, ✗, ✗, None
f ✗, ✗, ✗, ✓, Rational

- 5 in order from the left:

-7.25 , -5.5 , -2 $\frac{1}{3}$, 2.5 , 4 $\frac{1}{2}$, 7 $\frac{3}{4}$

- 6 a 0.8 b $\frac{3}{4}$ c -2.5
d 0 e -0.6 f $-3\frac{1}{7}$
7 a < b < c <
d < e < f <
g = h > i < j <

- 8 a 1 Ascending: -4 , 0.6 , 2 $\frac{3}{7}$, 3 $\frac{5}{9}$, 5 $\frac{3}{8}$
2 Descending 5 $\frac{3}{8}$, 3 $\frac{5}{9}$, 2 $\frac{3}{7}$, 0.6 , -4
b 1 Ascending : - $\frac{1}{4}$, -0.2 , $\frac{1}{4}$, 0.3 , $\frac{1}{2}$
2 Descending: $\frac{1}{2}$, 0.3 , $\frac{1}{4}$, -0.2 , - $\frac{1}{4}$

Quiz

- 1 a rational number b $\frac{8}{9}$
c > d -4 , -6
2 a -5.9 b -1
c rational d 0
3 The order: 7.7 , -3 $\frac{1}{5}$, -3.8 , -7 , -7 $\frac{1}{2}$

Lessons 5&6

- 1 a 10 b 4 c $\frac{2}{3}$
d $\frac{4}{7}$ e 2.05 f 12.5
2 a 9 b 15 c -1.2
d 11 e 6 or -6
3 a < b > c >
d > e < f =
4 The order: -4 , -3.4 , |0.8| , 2.5 , |-5.3|
5 a B b A c -4.8

Quiz

- 1 a < b > c =
d >
2 a 8 b 5 c 10
d -3
3 The order : - $\frac{1}{3}$, $|\frac{2}{3}|$, $|1\frac{1}{3}|$, $\frac{9}{5}$
4 The order : $\frac{1}{2}$, 0.2 , |0.02| , - $|2\frac{1}{2}|$

Unit 3

Lessons 1&2

1

Coefficient	Variable
3	m
-5	y
1	a, b
$-\frac{3}{7}$	n
6	x, y, z

2 a numerical b algebraic

c numerical d algebraic

e algebraic

3

Variables	Constants	Coefficients
a, c	7	2, 4
x	17, 5	1
y	22, $\frac{1}{5}$	2
q, r, s	-	0.2, 0.6, 0.8
-	8	-

4

Number of Terms	Like Terms
3	$x, \frac{3}{8}x$
4	$m, 2m, 3, 2$
2	$16x, 2x$
4	$7x, 7x, 2x$

5 a $\frac{1}{6}m$ kg b 7n hours

Quiz

1 a -5 b $5a, 2a$ c 3

2 a numerical expression or algebraic expression

b numerical expression c a, b

3 a $\rightarrow 3$ b $\rightarrow 1$ c $\rightarrow 2$

Lesson 3

1 a $x+5$ b $y-3$ c $4a$

d $2n$ e $\frac{m}{2}$ or $\frac{1}{2}m$

f $\frac{5}{t}$ or $5 \div t$

2 a 1 x plus 7 2 the sum of x and 7

b 1 x minus 3 2 x decreased by 3

c 1 the product of x and 8

2 8 times x

d 1 x divided by 3

2 third x

3 a $3m+6$ b $3a-4$

c $\frac{1}{2}y+7$ d $2(b+6)$ e $2b+6$

4 a sum of triple x and 2

b 4 times y minus 6

c third x minus 4

d 6 times the sum of a and 7

e 3 times the difference between s and 2

5 a $3y-12$ b $4c$ c $14e \div 2$

d $\frac{d}{15}$

Quiz

1 a x decreased by 2

b the sum of 7 and 5 times a

c double y subtracted from 36

2 a $y-3$

b $2(x+7)$

c $x, -$

3 a $\rightarrow 4$

b $\rightarrow 1$

c $2 \rightarrow 2$

d $\rightarrow 3$

Lesson 4

1 a $24+6=30$ b $13 \times 7=91$

c $[1.5 \times 20] - 15 = 30 - 15 = 15$

d $28 \div [4 \times 3.5] = 28 \div 14 = 2$

2 a 3

b 7

c $7 \times 7 \times 7 \times 7$ d 9

e 8

Guide Answers

- f 1 g 0 h 1
i 0 j 1 k 0
- 3 a $2 \times 5 + 9 = 10 + 9 = 19$
b $64 \div 16 \times 5 = 4 \times 5 = 20$
c $20 \times 9 - 52 \times 4 = 20 \times 9 - 25 \times 4$
 $= 180 - 100 = 80$
d $100 \times [3 \times 1.23] = 100 \times 3.69 = 369$

Quiz

- 1 a 27 b $6 \times 2 = 12$ c $8 \times 3 = 24$
d $8 + 25 - 1 = 33 - 1 = 32$
e $(32 + 3) \div (8 - 1) = 35 \div 7 = 5$
- 2 a $4 \times 4 \times 4$ b 2 c $>$
d 2^4 e 1

Lessons 5-7

- 1 a 25a pounds b 65b pounds
c $34x + 5$ pounds d $22 - 3y$ pounds
- 2 a $5 \times 0.4 + 2 = 2 + 2 = 4$
b $9 \times 2 - 2^3 = 9 \times 2 - 8 = 18 - 8 = 10$
c $28 \div (5 + 2) + 7 = 28 \div 7 + 7 = 4 + 7 = 11$
d $12 \div (4^2 - 10) = 12 \div (16 - 10) = 12 \div 6 = 2$
e $2^3 \times 3 \div 6 = 8 \times 3 \div 6 = 24 \div 6 = 4$
f $6^2 \div 3 \times (4 - 2) = 6^2 \div 3 \times 2 = 36 \div 3 \times 2$
 $= 12 \times 2 = 24$
- 3 a $30y + 100$
b $30 \times 3 + 100 = 90 + 100 = 190$ pounds
- 4 Answer by yourself.

Quiz

- 1 a $9k$ b $7z$ c $2 \times 7 = 14$
d no
- 2 a $\rightarrow 2$ b $\rightarrow 3$ c $\rightarrow 1$
- 3 a 6 b 2 c 6

Unit 4

Lesson 1

- 1 a $4x = 8, x = 2$ b $x + 5 = 11, x = 6$
c $3x = 12, x = 4$ d $x + 3 = 7, x = 4$
- 2 a $x + 7 - 7 = 15 - 7, x = 8$
b $a - 6 + 6 = 5 + 6, a = 11$
c $4 + y - 4 = 6 - 4, y = 2$
d $\frac{6m}{6} = \frac{18}{6}, m = 3$
e $\frac{n}{5} \times 5 = 3 \times 5, n = 15$
f $\frac{1}{4} t \times 4 = 2 \times 4, t = 8$

Quiz

- 1 a $x + 2 - 2 = 11 - 2, x = 9$
b $m - 7 + 7 = 9 + 7, m = 16$
c $5y \div 5 = 45 \div 5, y = 9$
d $\frac{k}{8} \times 8 = 6 \times 8, k = 48$
- 2 a 18 b 6 c 9

Lessons 2&3

- 1 b, e
2 b, c, f
- 3 a $x > 4$ b $x < -3$ c $x \geq -1$
d $x \leq 5$ e $x > 7$ f $x \leq -1$
- 4 a greater than -5
b less than 1
c less than or equal to -2
d greater than or equal to 4
- 5 a $x > -4$ or $x \geq -3$
b $x > 0$ or $x \geq 1$
c $x < 0$ or $x \leq -1$
d $x < 4$ or $x \leq 3$
- 6 Many answers are accepted.

a 1, 2, 3 b -1, -2, -3

c -1, 0, 1 d -1, -2, -3

e 5, 6, 7 f 3, 2, 1

7 a $\times$ b $\times$ c $\times$

d $\checkmark$ e $\checkmark$

8 a $\times$ b $\checkmark$ c $\times$

d $\checkmark$ e $\times$

Quiz

1 a all values greater than -5

b all values less than or equal to 2

2 a $x > 0$ or $x \geq 1$ b $x \leq 6$ or $x < 7$

c $x \geq -3$ or $x > -4$

3 a $x > 2$ b $x > -1$ c 1

Theme 2

Unit 5

Lessons 1&2

1 a The number of study hours, the exam result

b Level of education, the job

c The distance traveled, fuel consumption

d The number of chocolate bars, the amount paid

2 Independent: x, m, s, t

Dependent: Y, z, a, f

3 a $y = x + 6$ b x (Sameh)

c y (Ahmed)

d $y = 12 + 6 = 18$ years

4 $y = 3x, y = 4x, y = 6x, y = 8x$

$3 \times 8 = 24, 4 \times 8 = 32, 6 \times 8 = 48, 8 \times 8 = 64$

Quiz

1 a x, y

b The amount of electricity consumption / the value of the electricity bill

c The number of points he gets/ the number of times he hits the target

2 a $y = 100x$

b The number of months " x "

c The total money she saved " y "

d $y = 6 \times 100 = 600$ pounds

Lesson 3

1 a multiply by 8 b $y = x + 9$

c $y = \frac{x}{3}$

d multiply by 3, then add 7

e subtract 3, then divide the result by 2

2 a 12, 12, add 2, $y = x + 2$

b 5, 14, subtract 5, $y = x - 5$

c 12, 5, divide by 3, $y = \frac{x}{3}$

d 20, 6, multiply by 4, $y = 4 \times p$

3 a 13, multiply by 3, then subtract 2,

$y = 3x - 2$

b 18, divide by 3, then subtract 1,

$y = x \div 3 - 1$

c 5, add 1, then multiply the sum by 2,

$y = (x + 1) \times 2$

d 2, subtract 1, then divide the result by 2,

$y = (x - 1) \div 2$

4 a $y = 2x, y = 2 \times 2.3 = 4.6$

b $y = x + 6, y = \frac{1}{5} + 6 = 6\frac{1}{5}$

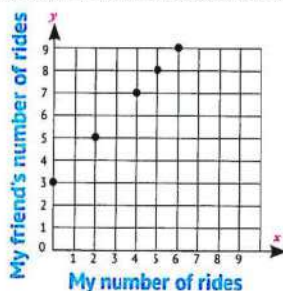
c $y = 3x + 4, y = 3 \times 5 + 4 = 19$

Quiz

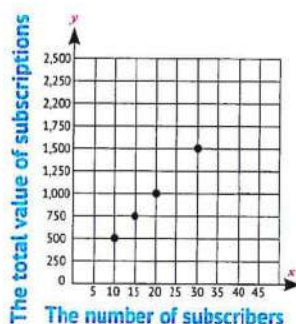
- a $y = x + 8$ b $y = 3.2 - x$
 c $y = 5(5 + 2) = 5 \times 7 = 35$
- a $y = 4x$ b $y = 2x + 5$ c 7
- 5, 25 add 1, then multiply the result by 5,
 $y = (x + 1) \times 5$

Lesson 4

- The table:
 3, 5, 7, 8, 9
 The equation is:
 $y = x + 3$
 Points: (0, 3) - (2, 5) - (4, 7) - (5, 8) - (6, 9)

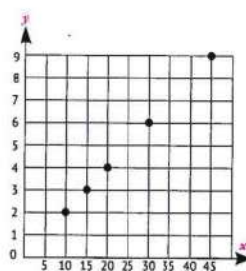


- The table:
 500, 750, 1000, 1500
 The equation is
 $y = 50x$
 Points: (10, 500) -
 (15, 750) -
 (20, 1000) - (30, 1500)



Quiz

- a x-axis b y-axis
 c Horizontal
 d y-axis
- 2, 3, 4, 6, 9
 Points: (10, 2) - (15, 3) -
 (20, 4) - (30, 6) - (45, 9)



Unit 6

Lesson 1

- a Statistical b Statistical
 c Non-statistical
 d Statistical e Non-statistical
 f Non-statistical
 g Statistical h Non-statistical
- a Numerical b Categorical
 c Categorical d Categorical
 e Numerical f Categorical
 g Numerical h Numerical

Quiz

- a Statistical, Non-statistical
 b Numerical, Categorical
 c numbers
 d adjectives or words
 e Statistical
- a Favorite colors b Salaries
 c lengths d types of pets
 e non-statistical

Lessons 2&3

- a histogram b bar graph c bar graph
 d bar graph e histogram f bar graph
- 7, 4, 6, 5, 10, graph by yourself.

Quiz

- a 2 b 3 c 1
- 6, 6, 7, 10, 2

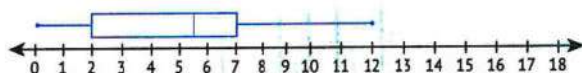
Lesson 4

- 1 a The order: 2, 4, 5, 9, 9 • median: 5
 b The order: 0, 2, 5, 7, 8, 11
 • median: $(5 + 7) \div 2 = 6$
 c The order: 1, 2, 3, 3, 6, 8, 9
 • median: 3
 d The order: 0, 2, 5, 5, 6, 7, 8, 11
 • median: $(5 + 6) \div 2 = 5.5$

- 2 a 1 b 5 c 8
 d 11 e 13

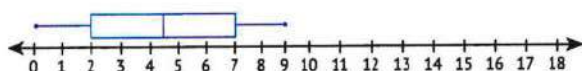
- 3 a The order: 0, 1, 2, 2, 5, 6, 6, 7, 10, 12

① 0 ② 2 ③ 5.5 ④ 7 ⑤ 12



- b The order: 0, 1, 2, 2, 3, 4, 4, 5, 6, 7, 7, 8, 8, 9

① 0 ② 2 ③ 4.5 ④ 7 ⑤ 9



Quiz

- 1 The order: 2, 3, 3, 7, 7, 8, 11

a 2 b 3 c 7
 d 8 e 11

- 2 a 1 b 4 c 9
 d 13 e 17

Lesson 5

- 1 a ① 15, ✓, ✓, ✗
 ② 120, ✓, ✗, ✓
 ③ 0, ✓, ✗, ✗ ④ 4, ✓, ✓, ✗
 ⑤ 4, ✓, ✓, ✗ ⑥ 95, ✓, ✗, ✓
 ⑦ 90, ✓, ✗, ✗

- b ① How many movies are exactly 100 minutes long?
 ② How many movies are from 105 to 115 minutes long?
 ③ What is the median?

Quiz

- 1 a 3 b 1 c 2
 2 a ① How many students were absent for 5 days?
 ② How many students were absent for 2 days?
 b ① What is the most frequent interval?
 ② What is the least frequent interval?
 c ① What is the median?
 ② What is the lower quartile?

Unit 7

Lessons 1&2

- 1 a 6 b 17 c 7
d 7
- 2 $(8 + 9 + 12 + 7 + 3 + 9) \div 6$
 $= 48 \div 6 = 8$
- 3 a $(40 + 38 + 36 + 34 + 32) \div 5$
 $= 180 \div 5 = 36$
b $(25 + 12 + 3 + 18) \div 4$
 $= 48 \div 4 = 14.5$
c $(3 + 3 + 5 + 7 + 2 + 4 + 7 + 3) \div 8$
 $= 34 \div 8 = 4.25$
d $(52 + 98 + 60) \div 3$
 $= 210 \div 3 = 70$
- 4 a $7 \times 6 = 42 \rightarrow x + 37 = 42 \rightarrow x = 42 - 37 = 5$
b $\text{sum} = 6 \times 5 = 30 \rightarrow x + 26 = 30 \rightarrow x = 30 - 26 = 4$

Quiz

- 1 a 50 b 5 c 6
d 6 e 45
- 2 7

Lesson 3

- 1 a 8 b 7 c plane
d 2 e none f 12
g 10, 13

- 2 a 19 b 2 c non
d 2, 3 e none f 11
- 3 a Mean decreases
b Mean increases
c Mean stays the same
- 4 a Median b Mean c Either

Quiz

- 1 a 2 b 6 c 7
d 23
- 2 a 6 b 4 c 4
d 11 e median

Lesson 4

- 1 a 7 b 61 c 72
d 11 e 44
- 2 a 19, 10, 9 b 10, 1, 9 c 18, 9, 9
d 30, 20, 10
- 3 a 30, 22, 8 b 6, 3, 3

Quiz

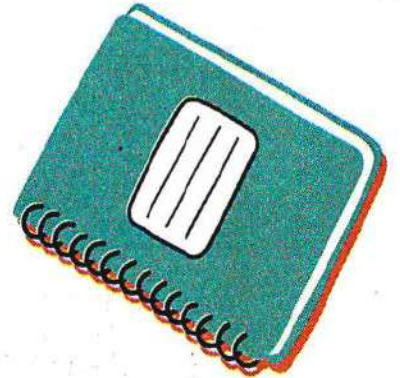
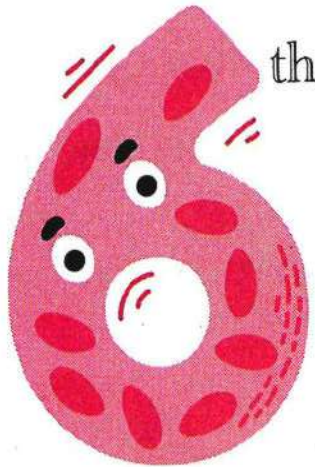
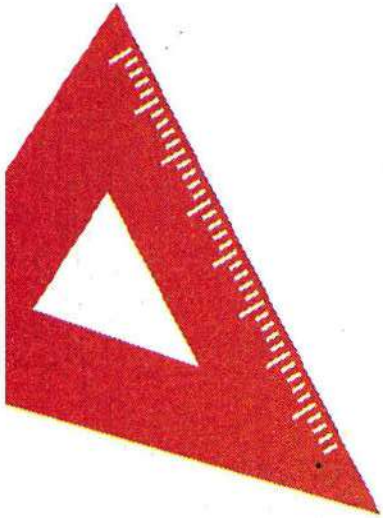
- 1 a 14 b 12 c 13
d 12 e 2
- 2 a $8 - 0 = 8$ b 6 c 0
- 3 a $8 - 1 = 7$ b 4

PONY

سلسلة كتب الاستاذ

Math

Exercises Book



Primary

First Term

Mohamed Nasreldin



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Theme

1

Unit

1

Division, Factors, and Multiples

Concept 1.1: Division Algorithm, GCF, and LCM

Unit

2

Rational Numbers

Concept 2.1: Explore the Number Line

Concept 2.2: Investigate Rational Numbers

Concept 2.3: Interpret and Use Absolute Value

Unit

3

Algebraic Expressions

Concept 3.1: Use and Analyze Expressions

Concept 3.2: Algebraic Expressions and Exponents

Unit

4

Equations and Inequalities

Concept 4.1: Write and Solve Equations and Inequalities

Number Sense and Operations (Expressions and Equations)

Theme Units: 

Unit 1 Division, Factors, and Multiples

Concept 1.1 Division Algorithm, GCF, and LCM

Lesson 1

1 Complete the following table:

	Division	Quotient	Remainder	Divisible/ Not Divisible
a	$45 \div 5$	.....	.....	45 is by 5.
b	$25 \div 4$	.....	.....	24 is by 4.
c	$60 \div 7$	.....	.....	60 is by 7.
d	$78 \div 6$	.....	.....	78 is by 6.
e	$35 \div 4$	.....	.....	35 is by 4.
f	$81 \div 9$	.....	.....	81 is by 9.
g	$28 \div 7$	.....	.....	28 is by 7.
h	$19 \div 4$	.....	.....	19 is by 4.
i	$120 \div 4$	.....	.....	120 is by 4.
j	$154 \div 5$	.....	.....	154 is by 5.
k	$245 \div 5$	.....	.....	245 is by 5.
l	$451 \div 3$	.....	.....	451 is by 3.
m	$102 \div 4$	.....	.....	102 is by 4.
n	$208 \div 2$	.....	.....	208 is by 2.

2 Circle the numbers that are divisible by 2:

30	65	97	54	26
258	216	925	743	250
151	368	654	239	2,544

3 Circle the numbers that are divisible by 3:

45	36	28	456	558
457	777	891	4,054	3,332
652	100	12,748	445	4,662

4 Circle the numbers that are divisible by 4:

32	46	82	203	612
440	2,100	2,003	1,054	3,636
32,100	65,002	40,056	63,122	30,008

5 Circle the numbers that are divisible by 5:

45	36	250	156	558
154	830	940	630	2,005
354	101	12,745	55,551	1,20

6 Use the following numbers to complete:

335 532 711 650 345 762 900

- a The numbers that are divisible by 2:
- b The numbers that are divisible by 3:
- c The numbers that are divisible by 4:
- d The numbers that are divisible by 5:
- e The numbers that are divisible by 6:
- f The numbers that are divisible by 10:

7 Complete the table using (✓) or (X):

	Number	Divisible by...					
		2	3	4	5	6	10
a	15						
b	28						
c	30						
d	130						
e	600						
f	102						
g	750						
h	405						
i	2,300						
j	4,256						

8 Complete the following:

- Any number is divisible by another if the remainder of the division operation is _____.
- If $36 \div 5 = 7$ and R1, so 36 is _____ by 5.
- All even numbers are divisible by _____.
- A number is divisible by 2 if its Ones digit is _____, _____, or _____.
- A number is divisible by 3 if the sum of its digits is a multiple of _____.

- f 652 is not divisible by 3 because $6 + 5 + 2 = 13$,
and 13 is of 3.
- g A number is divisible by 4 if the Ones and Tens digits of the number are
divisible by
- h If the Ones digit of a number is 0 or 5, then the number is divisible by
.....
- i 3 is a factor of 12, so is divisible by
- j 24 is a multiple of 4, so is divisible by
- k 28 is divisible by 7 because is a multiple of, or
..... is a factor of

9 Choose the correct answer:

- a 26 is divisible by (2 or 3 or 4 or 6)
- b is divisible by 3. (133 or 236 or 304 or 213)
- c If the Ones digit of a number is zero, then it is divisible by
(5 only or 2 and 5 only or 5 and 10 only or 2, 5, and 10)
- d The smallest 2-digit number that is divisible by 2 and 3 is
(0 or 6 or 12 or 18)
- e The smallest 2-digit number that is divisible by 2 and 5 is
(0 or 5 or 10 or 15)
- f The smallest 2-digit number that is divisible by 6 is
(0 or 6 or 12 or 18)
- g If 51 is divisible by 3, then 51 is a of 3. (multiple or factor)
- h "35 + " is divisible by 3. (0 or 1 or 2 or 3)

Assessment**on Lesson 1****1 Choose the correct answer:**

- a 30 is divisible by 6 because $6 \times \dots = 30$. (5 or 6 or 30 or 4)
- b The number 4,101 is divisible by (2 or 3 or 4 or 5)
- c If 25 is multiple of 5, then 25 is by 5.
(divisible or not divisible)
- d is divisible by 2 and 3. (23 or 81 or 18 or 21)
- e The number 108 is divisible by the two prime numbers 3 and
(2 or 5 or 7 or 11)
- f All the numbers are divisible by 2.
(odd or even or prime or whole)
- g is the smallest number divisible by each of 2 and 5.
(5 or 10 or 15 or 20)

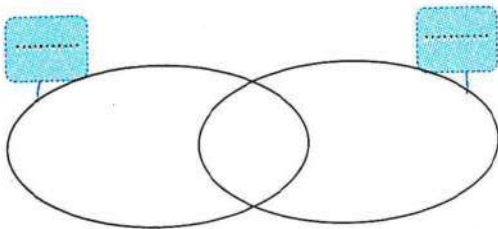
2 Use the numbers 816, 720, 4,955, and 1,239 to complete:

- a The numbers divisible by 2 are
- b The numbers divisible by 3 are
- c The numbers divisible by 4 are
- d The numbers divisible by 5 are
- e The numbers divisible by 6 are
- f The numbers divisible by 10 are

Lesson 2

1 Find the **GCF** and **LCM** using the Venn diagram in each of the following:

a 6 and 8



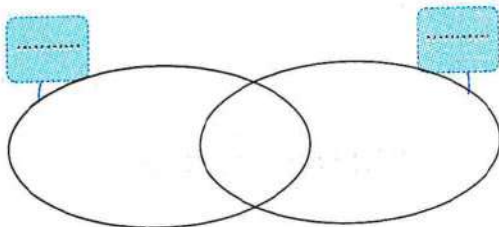
GCF = _____

LCM = _____

6 = _____

8 = _____

b 24 and 18



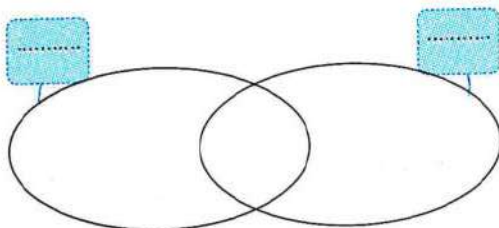
GCF = _____

LCM = _____

24 = _____

18 = _____

c 4 and 9



GCF = _____

LCM = _____

4 = _____

9 = _____

2 Complete the following table:

	Numbers	Prime Factors	GCF	LCM	Relatively prime Numbers (Yes or No?)
a	6 and 4	6 = 4 =			
b	15 and 6	15 = 6 =			
c	8 and 9	8 = 9 =			
d	12 and 14	12 = 14 =			
e	18 and 9	18 = 9 =			
f	6 and 25	6 = 25 =			

3 Complete using the Venn diagram in each of the following:

a 1 The two numbers represented in the Venn diagram are and

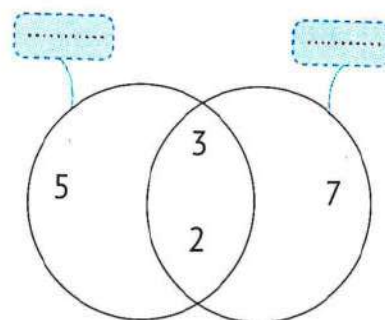
2 The common prime factors of the two numbers are

3 The GCF of the two numbers is

4 The LCM of the two numbers is

5 Are the two numbers relatively prime numbers?

(Yes or No)



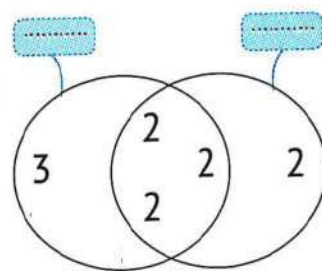
b 1 The **two** numbers represented in the Venn diagram are and

2 The common prime factors of the **two** numbers are

3 The **GCF** of the two numbers is

4 The **LCM** of the two numbers is

5 Are the two numbers **relatively prime numbers**? (Yes ☒ No ☐)



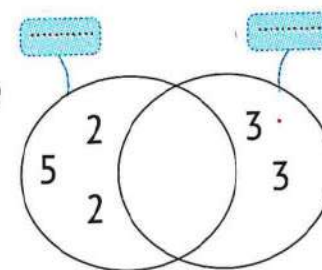
c 1 The **two** numbers represented in the Venn diagram are and

2 The common prime factors of the **two** numbers are

3 The **GCF** of the two numbers is

4 The **LCM** of the two numbers is

5 Are the two numbers **relatively prime numbers**? (Yes ☐ No ☒)



4 Complete the following:

- The prime number has only factor(s).
- All prime numbers are odd numbers, except is an even number.
- is the smallest prime number.
- is the smallest odd prime number.
- is a number greater than one, and it has two factors only.
- The smallest two-digit prime number is
- Prime numbers less than 10 are
- The prime factors of 21 are
- A number whose prime factors are 3, 3, and 2 is

j Two numbers are relatively prime numbers if their greatest common factor is

k The least common multiple of the two relatively prime numbers is

5 Choose the correct answer:

a is a factor of all numbers. (0 or 1 or 2 or 3)

b is a prime number. (59 or 57 or 52 or 51)

c 3 and 5 together are prime factors of the number (30 or 53 or 18 or 25)

d The prime number (has no factors or has only one factor or has only two factors or has only three factors)

e 7, 5, 3, and 2 are numbers. (even or odd or prime or other)

f The prime factors of 12 are (2×6 or 3×4 or $2 \times 2 \times 3$ or 1×12)

g If the prime factors of a number are $2 \times 2 \times 2$, then the number is (8 or 4 or 6 or 222)

h The greatest common factor of any two prime numbers is (0 or 1 or their sum or their product)

i The greatest common factor of two relatively prime numbers is (0 or 1 or their sum or their product)

j The least common multiple of any two prime numbers is (the smallest number or 1 or their sum or their product)

k The least common multiple of two relatively prime numbers is (the smallest number or 1 or their sum or their product)

l The greatest common factor of the numbers 4 and 15 is (0 or 1 or 4 or 5)

m 6 and are relatively prime numbers. (4 or 15 or 35 or 20)

n The least common multiple of 9 and 8 is (9 or 8 or 1 or 72)

o The greatest common factor of a number whose prime factors are 2 and 5 and a number whose factors are 3 and 7 is

(0 or 10 or 1 or 210)

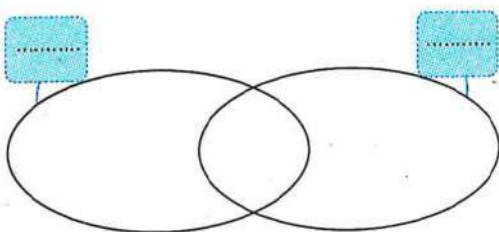
Assessment

on Lesson 2

1 Choose the correct answer:

- a A number whose prime factors are 2 , 3 , and 7 is
(12 or 18 or 42 or 13)
- b The greatest common factor of any two prime numbers is
(0 or 1 or 2 or 3)
- c The common multiple of all numbers is (0 or 1 or 2 or 3)
- d The greatest common factor of two relatively prime numbers is
(0 or 1 or their sum or their product)
- e The least common multiple of two relatively prime numbers is
(0 or 1 or their sum or their product)
- f The greatest common factor of the numbers 10 and 9 is
(0 or 1 or 4 or 5)
- g 8 and are relatively prime numbers. (4 or 12 or 9 or 6)
- h The two numbers are relatively prime numbers.
(2 and 4 or 4 and 6 or 6 and 9 or 9 and 4)

2 Find the GCF and LCM of 16 and 12 using a Venn diagram:



GCF =

LCM =

16 =

12 =

Lesson 3

1 Complete the following:

a $7 \times (5 + 2) = (\dots \times \dots) + (\dots \times \dots)$

b $8 \times (2 + 9) = (\dots \times \dots) + (\dots \times \dots)$

c $\dots \times (\dots + \dots) = (8 \times 5) + (8 \times 3)$

d $\dots \times (\dots + \dots) = (3 \times 3) + (3 \times 7)$

e $5 \times (\dots + \dots) = (\dots \times 2) + (\dots \times 4)$

f $6 \times (\dots + \dots) = (\dots \times 8) + (\dots \times 7)$

g $\dots \times (5 + 1) = (7 \times \dots) + (7 \times \dots)$

h $\dots \times (4 + 3) = (2 \times \dots) + (2 \times \dots)$

2 A merchant has 18 kg of oranges and 27 kg of apples. If the merchant wants to divide the oranges and apples in bags of the same mass:

a What is the largest number of bags that can be made for each type of fruit?

b How many kilograms of oranges will each bag contain?

c How many kilograms of apples will each bag contain?

3 A hospital is staffed by 12 doctors and 28 nurses.

- Find the greatest number of equal groups that can be made of doctors and nurses together.
- How many doctors are in each group?
- How many nurses are in each group?

.....

.....

.....

.....

.....

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.....

.....

4 Mahmoud wants to divide the 24 pens and 36 notebooks into groups so that each group contains the same number of tools.

Write a numerical expression to express the largest number of groups that can be configured for each type of supply to have for each group.

.....

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5 Nour prepared bags that contain snacks. He has 6 oranges and 12 pieces of fruit. Nour wants the snacks in the bags to be distributed evenly without any food left.

Write a numerical expression to express the number of bags of snacks that Nour can prepare.

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Assessment

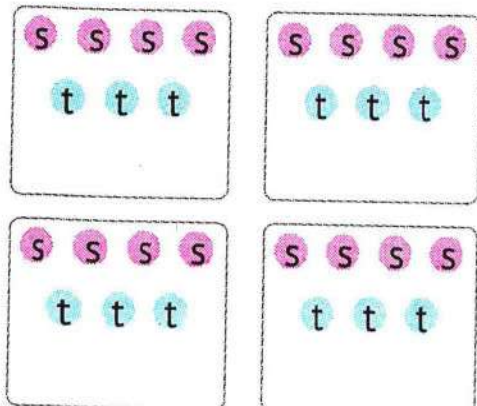
on Lesson 3

1 Choose the correct answer:

- a $4 \times (2 + 9) =$
 $((4 \times 2) + (4 \times 9))$ or $4 \times 2 + 9$ or $4 \times 2 \times 9$ or $(4 + 2) \times (4 + 9)$
- b $(6 \times 3) + (6 \times 2) =$
 $(6 \times 3 \times 2)$ or $6 + (3 \times 2)$ or $6 \times (3 + 2)$ or $6 \times 3 \times 6 \times 2$
- c $\times (5 + 1) = (7 \times 5) + (7 \times 1)$
 (5) or 1 or 7 or 6
- d The GCF of 18 and 12 is
 (6) or 9 or 2 or 3
- e The common multiple of all numbers is
 (0) or 1 or 2 or 3

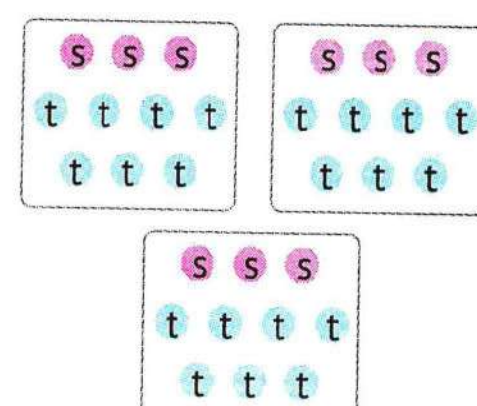
2 Write the numerical expression for each of the following figures:

a



..... $\times ($ $+$ $)$

b



..... $\times ($ $+$ $)$

3 Sameh wants to divide 21 pens and 35 notebooks into groups so that each group contains the same number of supplies. Write a numerical expression to express the largest number of sets that can be made for each type of supplies so that each set has the same number.

Lesson

4

1 Find the result in the simplest form:

a $\frac{1}{2} + \frac{2}{3} =$

b $4\frac{3}{4} + 9\frac{5}{12} =$

c $\frac{1}{4} + \frac{11}{16} =$

d $5\frac{7}{10} + 8\frac{3}{4} =$

e $1\frac{2}{3} + 1\frac{15}{24} =$

f $\frac{1}{4} - \frac{1}{6} =$

g $\frac{5}{6} - \frac{1}{9} =$

h $9\frac{1}{10} - 5\frac{7}{12} =$

i $5\frac{1}{7} - 2\frac{3}{4} =$

j $1\frac{2}{3} - 1\frac{3}{5} =$

2 Nagy bought $3\frac{1}{2}$ kg of oranges and $4\frac{1}{4}$ kg of bananas.

What is the total mass of fruit that Nagy bought?

3 Shimaa bought a pen for $9\frac{1}{2}$ pounds, a ruler for $5\frac{1}{4}$ pounds, and a notebook for 4 pounds. How much did Shimaa pay?

4 Wael collected $3\frac{3}{4}$ kilograms of dates and gave $2\frac{1}{5}$ kilograms to his friend. How many kilograms does Wael have left?

5 Hani is studying $4\frac{1}{2}$ hours per day, in which he spends $1\frac{1}{3}$ hours studying mathematics. How much time is left for studying the rest of the subjects?

6 Mohammed bought 3 pizzas of the same size and divided each of them in different ways for lunch with his friends. After the end of the meal, Muhammad noticed that there were some remaining pieces of pizza, which are as follows:

$\frac{1}{6}$ of the first pizza, $\frac{1}{4}$ of the third pizza, and $\frac{1}{3}$ of the last pizza

a What is the total number of pizzas remaining?

b How many pizzas did Mohamed and his friends eat?

- 7 A road of 15 km in length is paved in three stages, with $6\frac{2}{5}$ km in the first stage, and $4\frac{1}{2}$ km in the second stage.

How long is the distance paved in the third stage?

- 8 A family bought a set of plastic bags to store strawberries for later use; each bag contains 8 strawberries.

After a while, the mother opened 5 bags of strawberries for the family members to try some of each, trying to find the bags that contain the best taste.

The bags contain the remaining parts:

$$\frac{1}{8}, \frac{3}{8}, \frac{2}{8}, \frac{1}{8}, \frac{2}{8}$$

- a If the mother wants to repack the remaining pieces of fruit to form whole packets, how many bags are remaining?

- b Since there are 8 strawberries in each of the 5 bags, how many bags did the family eat?

Assessment

on Lesson 4

1 Choose the correct answer:

a $\frac{3}{5} + \frac{9}{10} = \dots\dots\dots$

($\frac{1}{10}$ or $1\frac{1}{2}$ or $1\frac{1}{5}$ or $\frac{12}{15}$)

b $1\frac{4}{5} + 2\frac{1}{3} = \dots\dots\dots$

($4\frac{2}{15}$ or $3\frac{2}{18}$ or $4\frac{5}{8}$ or $3\frac{5}{8}$)

c $3\frac{1}{2} - \dots\dots\dots = 1\frac{3}{8}$

($2\frac{5}{8}$ or $1\frac{1}{8}$ or $1\frac{5}{8}$ or $2\frac{1}{8}$)

d $3\frac{5}{6} + 1\frac{1}{3} = 4 + \dots\dots\dots$

(2 or $1\frac{1}{6}$ or $2\frac{2}{6}$ or $4\frac{2}{3}$)

2 Complete the following:

a $\dots\dots\dots - 1\frac{2}{3} = 2\frac{1}{2}$

b $2\frac{1}{2} - 1\frac{7}{8} = \dots\dots\dots$

c $2\frac{1}{3} + 1\frac{1}{4} = \dots\dots\dots$

3 Answer the following:

- a Hanaa has $15\frac{1}{2}$ pounds. She bought a ruler for $4\frac{1}{2}$ pounds and a pen for $5\frac{1}{2}$ pounds. How much money is left with Hanaa?
-
-

- b You bought a package of dates that contained 16 dates. You had already eaten one when you remembered that you owed your friend half a packet of dates.

1 What fraction represents the number of dates that you have to give to your friend?

2 After giving your friend his share, what fraction is the remaining amount of the fruit packet?



Assessment on Unit 1

First: Choose the correct answer:

1 18 is divisible by (12 or 7 or 8 or 6)

2 A number is divisible by 5 if its Ones digit is
(2 or 5 or 0 or 5 or 2 or 3 or 2 or 0)

3 All numbers are divisible by 2. (odd or even or prime or whole)

4 is a factor of all numbers. (0 or 1 or 2 or 3)

5 7 , 5 , 3 , and 2 are numbers.(even or odd or prime or otherwise)

6 The greatest common factor of any two prime numbers is
(0 or 1 or their sum or their product)

7 The least common multiple of two prime numbers is
(the greatest number or 1 or their sum or their product)

8 $6 \times (7 + 5) =$
($(6 \times 7) + (6 \times 5)$ or $6 \times 7 + 5$ or $6 \times 7 \times 5$ or $(6 + 7) \times (6 + 5)$)

9 $(2 \times 8) + (2 \times 3) =$
($2 \times 8 \times 3$ or $2 + (8 \times 3)$ or $2 \times (8 + 3)$ or $2 \times 8 \times 2 \times 3$)

Second: Answer the following:

1 Complete the following:

- a The prime number has only factor(s).
- b All prime numbers are odd numbers, except is an even number.
- c is the smallest prime number.

c Any two numbers are relatively prime numbers if their greatest common factor is

2 $8 \times (2 + 7) = (\dots \times \dots) + (\dots \times \dots)$

3 $3\frac{1}{5} + \dots = 5\frac{1}{2}$

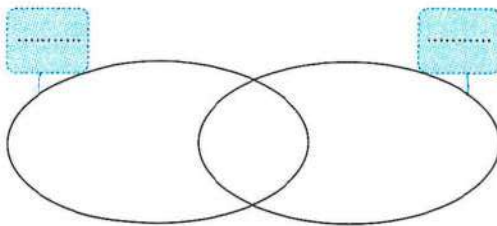
4 Find the result:

a $5\frac{3}{8} + 2\frac{5}{6} = \dots$

b $7\frac{1}{4} - 3\frac{3}{5} = \dots$

5 Maryam has 25 blue roses and 15 red roses that she wants to distribute in bouquets so that each bouquet contains the same number of roses of each color. Write numerical expressions using the greatest common factor.

6 Find the GCF and LCM of 24 and 16 using the Venn diagram:



GCF =

LCM =

24 =

16 =

7 Hany has 25 pounds. He bought a piece of cake for $9\frac{1}{2}$ pounds.

How much money does Hany have left?

Unit² Rational Numbers

Concept 2.1

Explore the Number Line

Lessons 1&2

1 Write an **integer** to represent each of the following:

- a The temperature is 12°C below zero. (.....)
- b The temperature is 40°C . (.....)
- c Salma dives 10 meters below sea level. (.....)
- d Ahmed withdrew 50 pounds from his savings account. (.....)
- e The height of the tree is 5 meters. (.....)
- f The value of the loss is 20 pounds. (.....)
- g The value of the gain is 16 pounds. (.....)
- h The amount of weight gain is 3 kilograms. (.....)
- i Hossam moved three steps back. (.....)
- j Ayman lost 150 pounds. (.....)

2 Write the numbers represented by the letters shown on the following number line:



- a A →
- b B →
- c C →
- d D →
- e E →
- f F →
- g G →
- h H →

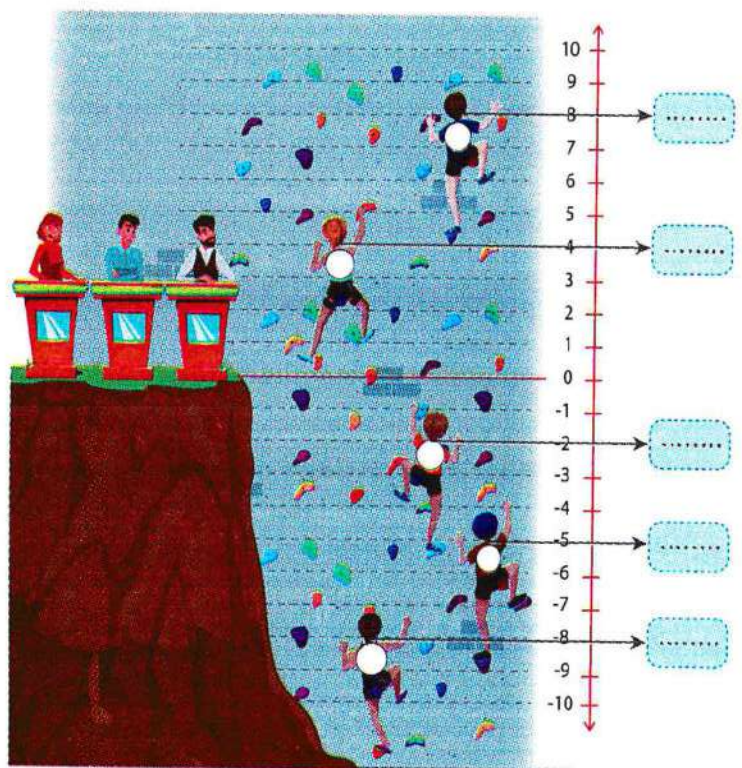
- 3 A group of people go indoor rock climbing together. There is an elevated platform in the middle of the giant rock wall.

Each climber's location is represented by their distance from the platform.

The following table shows the positions of each of the climbers relative to the platform (the platform location represents 0).

Locate each person on the following number line.

Person	The Position from the Platform in Meters
a	-5
b	4
c	8
d	-8
e	-2



- 4 Write the **next number** and the **previous number** for each of the following numbers:

The Previous Number					
The Number	10	-7	0	-5	9
The Next Number					

5 Complete using ($<$, $=$, or $>$):

a -5 9

b 2 6

c 7 3

d -1 -12

e -5 -9

f -2 4

g 1 0

h -6 6

i 7 -7

j 5 5

k -3 -3

l -1 0

6 Arrange the following numbers in **ascending** and **descending** order:

a $5, -6, 8, -3, 0$

Ascending order:

Descending order:

b $-1, 1, 0, -3, 3$

Ascending order:

Descending order:

7 Write the **opposite** of each of the following numbers:

a -9 $\rightarrow$

b 3 $\rightarrow$

c -12 $\rightarrow$

d 0 $\rightarrow$

e -1 $\rightarrow$

f 1 $\rightarrow$

8 Complete the following:

a The integer that expresses "the temperature is 15 below zero" is

b The integer that expresses "the height of the school building is 25 meters" is

c The next number to -5 is

d The number that comes before 0 is

- e The number “-12” is the opposite of the number
- f The opposite of “10” is
- g The smallest number in counting numbers is
- h The smallest positive integer is
- i The smallest non-negative integer is
- j The number and its opposite is on from zero,
but on two sides on the number line.

9 Choose the correct answer:

- a -3 is located to the right of the number on the number line.
(-4 or 4 or -2 or 2)
- b The number that comes just before is -1. (-2 or 2 or 0 or 1)
- c $-9 > \dots$ (-15 or 8 or -8 or 10)
- d The opposite of -12 is (-12 or 12 or 1 or 2)
- e The number is neither a positive nor a negative number.
(0 or 1 or -1 or 10)
- f The opposite of 5 > (-4 or 4 or -6 or 6)
- g The largest negative integer is (-1 or 1 or -100 or 0)
- h The largest non-positive integer is (-1 or 1 or -100 or 0)
- i All negative numbers are zero.
(greater than or less than or equal to)
- j All positive numbers are zero.
(greater than or less than or equal to)

Assessment on Lessons 1&2

1 Choose the correct answer:

- a The integer that expresses (the depth of a well is 5 meters) is
(-5 or 5 or -10 or 10)
- b An integer between the numbers 2 and -2 is (-1 or -3 or 3 or -4)
- c The number that comes just after -9 is (-10 or -8 or 10 or 8)
- d $-25 \square -12$ ($>$ or $=$ or $<$)
- e $6 < \dots$ (-8 or 8 or -9 or -7)
- f The integer that expresses "move forward 6 steps" is
(-6 or 6 or 3 or -3)
- g The additive inverse of 8 is (-8 or 8 or 0 or 1)
- h The smallest positive integer is (-1 or 1 or 0 or 2)

2 Answer the following:

- a Write all integers between -3 and 2
- b $-5, -4, -3, -2, \dots, \dots, \dots, \dots$
- c Arrange the following integers in an **ascending** order:

$-3, 9, -32, 0, 2$

- d Locate each of the following points on the number line:

Point	A	B	C	D	E
Number	0	3	-2	5	-3



Unit ² Rational Numbers

Concept 2.2 Investigate Rational Numbers

Lessons 3&4

- 1 Write each of the following numbers in fraction form $\frac{a}{b}$, then write its additive inverse:

Number	2.5	-0.8	5	$-3\frac{1}{2}$	$2\frac{3}{4}$
Fraction Form $\frac{a}{b}$					
Additive Inverse					

- 2 Complete using (belongs) or (does not belong):

- a 25 to the set of counting numbers.
- b -12 to the set of counting numbers.
- c $2\frac{5}{7}$ to the set of counting numbers.
- d 0 to the set of counting numbers.
- e -125 to the set of natural numbers.
- f 0 to the set of natural numbers.
- g $\frac{3}{8}$ to the set of natural numbers.
- h -56.5 to the set of integers.
- i 17 to the set of integers.
- j $-\frac{4}{5}$ to the set of rational numbers.

3 Write a **subset** or **not a subset**:

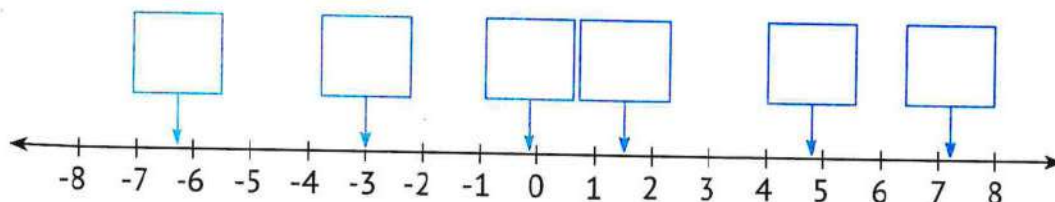
- a The set of counting numbers is of the set of natural numbers.
- b The set of counting numbers is of the set of integers numbers.
- c The set of natural numbers is of the set of counting numbers.
- d The set of natural numbers is of the set of integers numbers.
- e The set of integers numbers is of the set of natural numbers.
- f The set of integers numbers is of the set of rational numbers.
- g The set of rational numbers is of the set of integers numbers.
- h The set of rational numbers is of the set of natural numbers.

4 Classify all the following numbers according to the **number sets** shown. Put a tick (✓):

	Number	Counting Numbers	Natural Numbers	Integers	Rational Numbers	Subset
a	4					
b	0.5857					
c	0					
d	- 11					
e	4.9					
f	$\frac{43}{5-5}$					
g	12					
h	- 455					
i	- 28.765					
j	$-6\frac{2}{3}$					

- 5 Put the following numbers in the **appropriate places** on the following number line:

$$-3, 1.5, -\frac{3}{8}, -6\frac{1}{4}, 4\frac{2}{3}, 7.2$$



- 6 Complete using ($<$, $=$, or $>$):

a $\frac{2}{5}$ $\frac{3}{5}$

b $-\frac{6}{7}$ $\frac{7}{7}$

c $-\frac{5}{9}$ $\frac{8}{9}$

d $\frac{3}{8}$ $\frac{3}{5}$

e $-\frac{2}{5}$ $\frac{2}{3}$

f $-\frac{4}{5}$ $\frac{4}{7}$

g $\frac{2}{7}$ $\frac{1}{3}$

h $\frac{3}{4}$ $-\frac{4}{5}$

i $-\frac{2}{7}$ $-\frac{3}{4}$

j 0.5 $\frac{1}{2}$

k 2.4 $\frac{24}{100}$

l $-2\frac{1}{3}$ 0

- 7 Arrange each of the following groups of numbers in **ascending** and **descending** order:

a $2\frac{2}{3}, -5.5, 7\frac{1}{4}, 3.7, -1\frac{3}{5}$

Ascending order: _____

Descending order: _____

b $\frac{1}{2}, \frac{2}{3}, -0.82, 0.25, -\frac{1}{2}$

Ascending order: _____

Descending order: _____

8 Choose the correct answer:

a The number (-2.5) belongs to the set of

(counting numbers or natural numbers or integers or rational numbers)

b The number (5) does not belong to the set of

(counting numbers or natural numbers or integers or even numbers)

c The number (0) belongs to the set of

(counting numbers or natural numbers or negative integers or odd numbers)

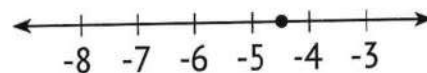
d The opposite of $-\frac{3}{4}$ is

($1\frac{1}{3}$ or $\frac{4}{3}$ or $-\frac{4}{3}$ or $\frac{3}{4}$)

e -6 in $\frac{a}{b}$ form is

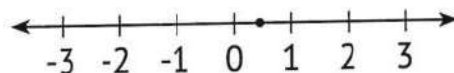
($\frac{6}{1}$ or $\frac{1}{6}$ or $-\frac{6}{1}$ or $-\frac{1}{6}$)

f The rational number represented on the corresponding number line is



($4\frac{2}{3}$ or $5\frac{2}{3}$ or $-4\frac{2}{3}$ or $-5\frac{2}{3}$)

g The rational number represented on the corresponding number line is



(-1.5 or -0.5 or 1.5 or 0.5)

h $\frac{3}{5}$ $-\frac{5}{3}$

($>$ or $=$ or $<$)

i $-\frac{7}{4} >$

($-\frac{8}{4}$ or $\frac{8}{4}$ or $-1\frac{3}{4}$ or $\frac{7}{4}$)

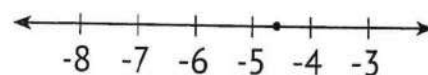
j $\frac{2}{3} <$

($\frac{2}{3}$ or $-1\frac{2}{3}$ or $-\frac{3}{2}$ or $\frac{3}{2}$)

Assessment on Lessons 3&4

1 Choose the correct answer:

- a The rational number represented on



the corresponding number line is

($4\frac{1}{2}$ or $5\frac{1}{2}$ or $-5\frac{1}{2}$ or $-4\frac{1}{2}$)

- b -2 belongs to the set of

(counting numbers or natural numbers or negative integers or odd numbers)

- c The set of integers is a subset of the set of numbers.

(counting or natural or even or rational)

- d The additive inverse of -5 is

(5 or -5 or $-\frac{1}{5}$ or $\frac{1}{5}$)

- e $-2\frac{3}{4}$ is between the two whole numbers

($2, 3$ or $1, 2$ or $-2, -3$ or $-1, -2$)

- f The additive inverse of 5.9 is

(-5.9 or 5.9 or 9.5 or -9.5)

- g -2.5 in the form $\frac{a}{b}$ is

(In its simplest form)

($-\frac{5}{10}$ or $\frac{5}{2}$ or $-\frac{5}{2}$ or $-\frac{10}{25}$)

2 Answer the following:

- a The rational number -5.6 lies between the two whole numbers and on the number line.

- b A set of natural numbers is a subset of a set of and also a subset of a set of numbers.

- c Arrange the following numbers in a descending order:

7.7 , 7 , -3.8 , $7\frac{1}{2}$, $-3\frac{1}{5}$

Unit² Rational Numbers

Concept 2.3

Interpret and Use Absolute Value

Lessons 5&6

1 Find the value of each of the following:

a $|-5| = \dots\dots\dots$

b $|-15| = \dots\dots\dots$

c $|6| = \dots\dots\dots$

d $|45| = \dots\dots\dots$

e $|\frac{7}{9}| = \dots\dots\dots$

f $|7\frac{3}{5}| = \dots\dots\dots$

g $|\frac{3}{4}| = \dots\dots\dots$

h $|-7\frac{2}{3}| = \dots\dots\dots$

i $|0.03| = \dots\dots\dots$

j $|-0.7| = \dots\dots\dots$

k $|7.04| = \dots\dots\dots$

l $|-6.5| = \dots\dots\dots$

2 Complete using ($<$, $=$, or $>$):

a -0.7 $|-0.7|$

b $|-9|$ $|-8|$

c 5.07 $|-5.07|$

d $|3.4|$ $|-3.4|$

e $|1.8|$ 1.8

f $|-8.2|$ -7.9

g $|-2.71|$ 2.7

h $|-75|$ 64

i $|\frac{2}{3}|$ $|\frac{1}{3}|$

j $-\frac{7}{8}$ $|\frac{7}{9}|$

k $|3\frac{1}{4}|$ $|-7\frac{2}{5}|$

l $4\frac{3}{4}$ $|2\frac{2}{3}|$

m $|\frac{8}{3}|$ $|2\frac{2}{3}|$

n $-3\frac{4}{5}$ $|\frac{3}{2}|$

o $|-3|$ -3

p $|\frac{3}{4}|$ $|\frac{3}{4}|$

- 3 Arrange each group of the following numbers in **ascending** and **descending** order:

a $8, -17, |-3|, -9, |12|$

Ascending order:

Descending order:

b $0.75, -\frac{5}{8}, |-0.5|, -\frac{3}{4}, |0.25|$

Ascending order:

Descending order:

- 4 Complete the following:

a If $5 = |a|$, then $a =$ or b If $b = |-7|$, then $b =$

c If $n = |9|$, then $n =$ d $-|5| =$

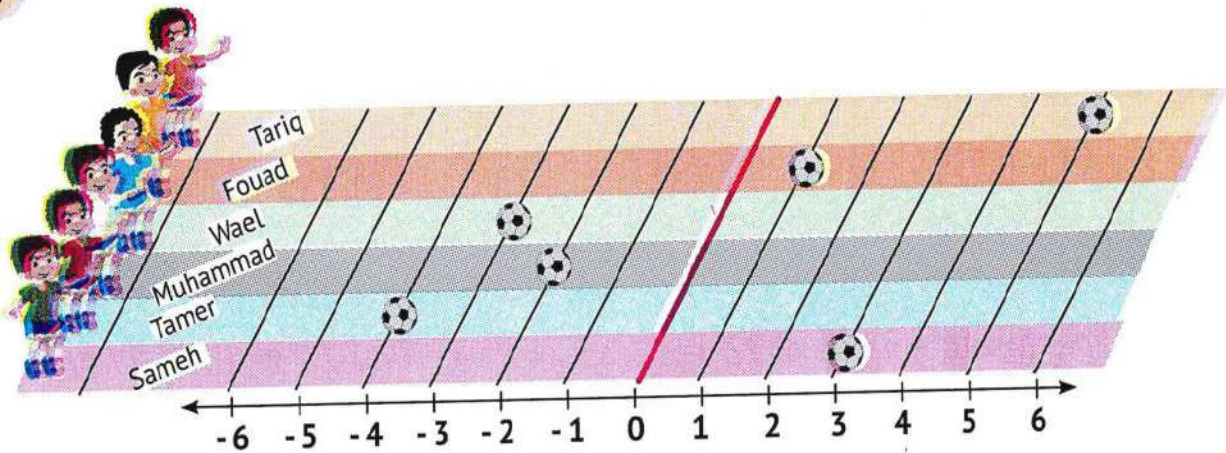
e $-|-4| =$ f $|9| + |-9| =$

- g If the temperature recorded in Moscow is -6 and the temperature recorded in Cairo is 4 , then the temperature of is lower because -6 4 .

- h If the height of mountain (A) above sea level is $1,200$ m, and the height of mountain (B) above sea level is $1,400$ m, then mountain lies at a distance closer to sea level.

- i Which is bigger -7.22 or -7.2 ?

5



On sports day, a group of children stood in one line to throw the ball towards a line parallel to them. The rules of the game dictate that the winner is the one who throws the ball to the nearest distance from the red line (before or after it), and a number line was drawn to know the distance at which the ball stops.

The results for the children were as shown:

Child	Sameh	Tamer	Muhammad	Wael	Fouad	Tariq
Distance	3	-4	-2	-3	1	5

a Complete the following:

- 1 The children who threw the ball before the line are
- 2 The children who threw the ball after the line are
- 3 The child whose ball has reached the closest distance from the line is (the winner).
- 4 The child whose ball has reached the farthest distance from the line is

b Arrange the children according to the distance between their ball and the red line, from the **least** to the **greatest**:

Assessment on Lessons 5&6

1 Choose the correct answer:

- a $|-1.5| =$ (1.5 or -1.5 or 15 or -15)
- b $|6| =$ (6, or -6 or 3 or -3)
- c The absolute value of 2.7 is..... (-2.7 or 2.7 or 27 or -27)
- d The absolute value of "zero" is (10 or 0 or -1 or 1)
- e The larger the absolute value, the the number is to zero.
(closer the number is to or farther the number is from or equal)

2 Answer the following:

- a If $5 = |m|$, then $m =$ or
- b Opposite numbers on a number line have the absolute values.
- c is closer to the number zero. (-2.5 or 0.7)
- d Arrange the following numbers in a **descending** order:

$$0.75, -\frac{1}{8}, \left|-\frac{1}{2}\right|, -\frac{1}{4}, |0.25|$$

.....

e Complete using (<, =, or >):

1 -0.9 $|-0.9|$

2 $|-1.5|$ -1.5

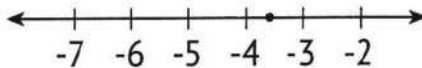
3 $|3\frac{1}{4}|$ $|-4\frac{1}{3}|$

4 $-\frac{2}{5}$ $|\frac{1}{2}|$



Assessment on Unit 2

First: Choose the correct answer:

- 1 -7 is to the right of on the number line. (-8 or 8 or -6 or 6)
- 2 is neither a positive number nor a negative number. (0 or 1 or -1 or 10)
- 3 The largest non-negative integer is (-1 or 1 or 100 or 0)
- 4 (-5.7) belongs to the set of
(natural numbers or integers or rational numbers or counting numbers)
- 5 The absolute value of "0" belongs to the set of
(counting numbers or natural numbers or negative integers or odd numbers)
- 6 The additive inverse of $-\frac{2}{3}$ is ($1\frac{1}{2}$ or $-\frac{3}{1}$ or $\frac{3}{2}$ or $\frac{2}{3}$)
- 7 -0.3 in the form $\frac{a}{b}$ is ($-\frac{3}{10}$ or $-\frac{1}{3}$ or $-\frac{3}{1}$ or $\frac{10}{3}$)
- 8 The rational number represented on the corresponding number line is

(-3.4 or -4.3 or 3.4 or 4.3)
- 9 The absolute value of "zero" is (10 or 0 or -1 or 1)

Second: Answer the following:

- 1 Write the integer that expresses (the temperature is 7 below zero)
(.....)
- 2 What are the two numbers between which the rational number "-7.2" lies? and
- 3 The set of natural numbers is a subset of and a subset of numbers.
- 4 Write the rational number $-\frac{3}{2}$ in the decimal form:

5 Find the value of " a " in each of the following:

a If $|a| = 8$, then $a = \dots$ or $\dots$.

b If $|5.6| = a$, then $a = \dots$.

6 Complete using ($<$, $=$, or $>$):

a -3.8 -1.8

b $|-2.5|$ $|-3.6|$

c $|\frac{2}{5}|$ $|-0.4|$

d $-3\frac{7}{8}$ $|-3\frac{5}{8}|$

7 Arrange the following numbers in a descending order:

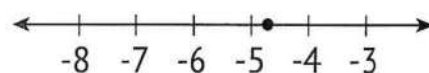
$$0.55, -\frac{3}{5}, |-\frac{1}{2}|, -\frac{1}{4}, |0.8|$$

ACCUMULATIVE ASSESSMENT

on Units 1&2



First: Choose the correct answer:



1 The rational number represented on

the corresponding number line is $\dots$. ($4\frac{2}{2}$ or $5\frac{2}{3}$ or $-4\frac{2}{3}$ or $-5\frac{2}{3}$)

2 12 and $\dots$ are relatively prime numbers.

(16 or 15 or 35 or 20)

3 The opposite of 6 $>$ $\dots$

(-5 or 5 or -7 or 7)

4 $\frac{3}{5}$ $-\frac{5}{3}$

($>$ or $=$ or $<$ or $\geq$)

5 -4 is to the right of $\dots$ on the number line.

(-5 or 5 or -3 or 3)

6 The additive inverse of $\dots$ is itself.

(0 or 1 or -1 or 2)

7 $-\frac{5}{4} = \dots\dots\dots$ (In the **decimal** form) $(-5.4 \text{ or } -4.5 \text{ or } -1.25 \text{ or } -12.5)$

8 $\dots\dots\dots$ is a number whose prime factors are 2, 2, and 7. $(11 \text{ or } 227 \text{ or } 28 \text{ or } 16)$

9 $4\frac{1}{3} + \dots\dots\dots = 5\frac{1}{2}$ $(1\frac{1}{6} \text{ or } 9\frac{5}{6} \text{ or } 9\frac{2}{5} \text{ or } 1\frac{1}{3})$

Second: Answer the following:

1 $\dots\dots\dots \times (\dots\dots\dots + \dots\dots\dots) = (2 \times 8) + (2 \times 6)$

2 $3\frac{5}{8} + 4\frac{1}{6} = \dots\dots\dots$

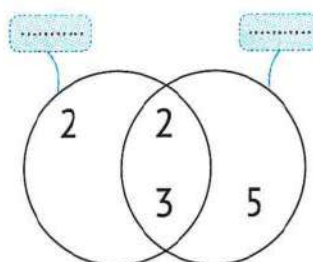
3 $4\frac{1}{2} - 1\frac{3}{4} = \dots\dots\dots$

4 Complete the following using the opposite

Venn diagram.

a The two numbers are $\dots\dots\dots$ and $\dots\dots\dots$.

b The GCF is $\dots\dots\dots$. c The LCM is $\dots\dots\dots$.



5 Find the value of "**b**" in each of the following:

a If $|b| = 5$, then $b = \dots\dots\dots$ or $\dots\dots\dots$.

b If $|3| = b$, then $b = \dots\dots\dots$.

6 What is the smallest positive integer? $(\dots\dots\dots)$

7 What is the next number to (-1) ? $(\dots\dots\dots)$

Unit 3 Algebraic Expressions

Concept 3.1 Use and Analyze Expressions

Lessons 1&2

1 Complete the following table:

	Algebraic Term	Coefficient	Variable
a	$-3ab$		
b	$5x$		
c	$-3y$		
d	$\frac{1}{5}xy$		
e	$-\frac{2}{8}m$		
f	$8abc$		
g	$7r$		
h	$5xyz$		
i	$6n$		
j	$\frac{3}{7}km$		
k	$23ab$		
l	$\frac{1}{6}yz$		

- 2 Classify the following mathematical expressions into (numerical expressions or algebraic expressions). Put a tick (✓):

	Mathematical Expression	Numerical Expression	Algebraic Expression
a	$2 + 7.8$		
b	$3(6) + 2$		
c	$2n$		
d	$\frac{1}{4}m - 2$		
e	$r + s - t$		
f	$4.5 + 56 + 2$		
g	$5 + 3$		
h	$5m + 3a - 2$		
i	$5 \times 3 + 4 \times 3$		
j	$q + 4$		

- 3 Complete the following table:

	Mathematical Expression	Variables	Constants	Coefficients
a	$5a + 8$			
b	$3a + 4b + 7$			
c	$6x + 15 + 2.5$			
d	$5y + 63$			
e	$0.2m + 12 + 0.3h + 5$			
f	$6w + 2 + 3 + 0.2$			

4 Complete the following table:

	Mathematical Expression	Number of Terms	Like Terms
a	3.9		
b	$5a$		
c	$3x + 7x$		
d	$2y + 7$		
e	$15 + 3 + x + y$		
f	$3b + 5b + 5 + 2b$		

5 Write a mathematical expression for each of the following situations:

- a Two numbers whose sum is 12; one of them is " d ", so what is the other number?
- b Ahmed's age exceeds his brother Essam's by three years. If Essam's age is " x " years, then what is Ahmed's age?
- c If Ramez has $\frac{1}{5}$ of what Emad has and if Emad has " w " pounds, then what does Ramez have?
- d If Hani has " x " pounds and he takes 10 pounds from his father, then Hani now has pounds.

6 Choose the correct answer:

- a In the algebraic term " $-3xy$ ", the coefficient is
(y or x or 3 or -3)
- b In the algebraic term " $\frac{3}{8}a$ ", the variable is
(a or 8 or 3 or $\frac{3}{8}$)
- c The number of terms that make up the algebraic expression " $5x + 3y + 2$ " is
(2 or 3 or 5 or 6)
- d The number of terms that make up the algebraic expression " $8 + 3 \times y$ " is
(2 or 3 or 4 or 5)
- e Like terms for the algebraic expression " $5 + 5y + 2y$ " are
($5, 5y$ or $5y, 2y$ or $5, 2y$ or $5, 5y, 2y$)
- f Like terms for the algebraic expression " $2 + 3b + 2a$ " are
($2, 3b$ or $2, 2a$ or $3b + 2a$ or none)
- g In the algebraic expression " $3y + 9$ ", the constant is
(9 or 3 or y or $3y$)
- h In the algebraic expression " $5a + 3b + 2 + 4$ ", the coefficients are
($2, 4$ or $5, 3$ or a, b or $5, 3, 2, 4$)
- i If the height of the school building is " m " meters and the height of the tree adjacent to this building is 10 meters less than it, then the height of the tree is meters.
($m + 10$ or $m - 10$ or $10m$ or $\frac{m}{10}$)

Assessment on Lessons 1&2

1 Choose the correct answer:

- a) Like terms in the algebraic expression $2a + 3ab + 3$ are
 ($2a$, $3ab$ or $3ab$, 3 or $2a$, 3 or none)
- b) The coefficients in the algebraic expression " $5a + 3b + 8 - 2.5$ " are
 (5 , 3 or 8 , 2.5 or $5a$, $3b$ or 5 , 3 , 8 , 2.5)
- c) Ahmed and Tamer have 60 pound. If Ahmed has x pounds, then Tamer has pounds.
 ($60 + x$ or $60 - x$ or $60x$ or $60 \div x$)
- d) The number of terms of the algebraic expression $2.5x + 2xy - 4$ is
 (3 or 4 or 5 or 6)
- e) The constants in the algebraic expression: $5a + \frac{2}{3} - 2b + 4$ are
 (5 , 2 or $\frac{2}{3}$, 4 or 5 , $\frac{2}{3}$ or 2 , 4)

2 Complete the following:

- a) The variable in the term " $2.5x$ " is
- b) The coefficient in the algebraic term $3xy$ is
- c) The number of terms in the algebraic expression $3xy - 25$ is
- d) Like terms in the algebraic expression $6x + 6y + 2x + 6$ are
- e) The constant in the algebraic expression $5b + 3.2$ is

3 Complete using the algebraic expression " $5x + 2y + 6x + 3$ ":

- a) The number of terms of the algebraic expression is
- b) The like terms are c) The coefficients are
- d) The constants are

Lesson 3

1 Express each of the following verbal forms using **algebraic expressions**:

- a Adding "**z**" to 36 (.....)
- b 5 less than "**x**" (.....)
- c 9 more than "**a**" (.....)
- d Three times of "**b**" (.....)
- e The product of "**p**" and 7.5 (.....)
- f Subtract 14 from "**y**" (.....)
- g Divide "**h**" by 6 (.....)
- h 9 divided by "**r**" (.....)
- i "**a**" increased by 3.5 (.....)
- j The sum of half "**q**" and 4 (.....)
- k 7 subtracted from twice "**w**" (.....)
- l Double of "**v**" minus 3 (.....)
- m Twice the sum of "**g**" and 6 (.....)
- n Three times the difference between "**s**" and 2 (.....)
- o The sum of three times "**a**" and 5 (.....)
- p Ammar has "**x**" coins, and Tamer has 7 more than Ammar. (.....)
- q Baher has "**m**" stickers in the sticker book and then puts up to 12 more stickers. (.....)
- r A student shared an orange equally with 2 of his friends. (.....)

2 Write each of these algebraic expressions using the **verbal form**:

a $a + 9$:

b $b - 6$:

c $7.5 - f$:

d $12y$:

e $8 \div s$:

f $K \div r$:

g $3x + 6$:

h $7 - 2x$:

i $\frac{1}{2}(m + 3)$:

j $5(c - 3)$:

3 Match each **verbal expression** with the appropriate **algebraic expression**:

a Twice the sum of " a " and 4 • $2a + 4$ 1

b The sum of twice of " a " and 4 • $4a$ 2

c The sum of " a " and 4 • $2(a + 4)$ 3

d The product of " a " by 4 • $a + 4$ 4

4 Choose the correct answer:

- a If we subtract 5 from the number " x ", the result is

($x + 5$ or $x - 5$ or $5 - x$ or $5x$)

- b If Zyad saved ' x ' pounds, and his father gave him 10 pounds, then he has

($x - 10$ or $x + 10$ or $10x$ or $10 - x$)

- c The algebraic expression representing (subtract 3 from twice

the number " x ") is ($x - 3$ or $2x - 3$ or $3x + 2$ or $5x$)

- d The algebraic expression representing (the difference between three times the number " y " and 2) is ($3y - 2$ or $2y - 3$ or $3 \times 2x$ or $\frac{3x}{2}$)

- e The algebraic expression that represents (three times the sum of the number " m " and 12) is

($3m + 12$ or $3(m + 12)$ or $12m + 3$ or $12(m + 3)$)

- f The algebraic expression representing (half the difference between the number " a " and 7) is

($\frac{1}{2}a - 7$ or $\frac{1}{2}a - 7$ or $\frac{1}{2}(a - 7)$ or $\frac{1}{2}(a + 7)$)

- g If Bassem is " x " years old now, how old will he be after 5 years?

($x - 5$ or $x + 5$ or $5 \div x$ or $5x$)

- h Which of the following operations expresses the mathematical expression (double the number plus 4)?

($+$, $-$ or $\times$, $-$ or $\times$, $+$ or $\times$, $\div$)

Assessment**on Lesson 3****1 Choose the correct answer:**

- a The number "**m**" plus 18 and the result divided by 3 =
 $(3 \div (m + 18))$ or $(m + 18) \div 3$ or $\frac{m}{3} + 18$ or $m + \frac{18}{3}$
- b If "**b**" is an integer, then the integer next to it is
 $(b + 1)$ or $b - 1$ or $2b$ or $\frac{b}{2}$
- c A square of side length "**s**" cm has a perimeter of cm.
 $(s + 4)$ or $s - 4$ or $\frac{s}{4}$ or $4s$
- d Two numbers whose sum is 35 and one of them is "**w**", then the other number is
 $(w + 35)$ or $w - 35$ or $35 - w$ or $35w$
- e The price of a kilogram of meat increased by 120 pounds. If its price becomes "**x**" after the increase, then its price before the increment is
 $(x + 120)$ or $x - 120$ or $12 - x$ or $120x$

2 Complete the following:

- a What is the verbal form of the algebraic expression $\frac{a}{5} + 3$?

- b What is the verbal form of the algebraic expression $6m$?

- c Write the algebraic expression of the verbal form "three times **b**".
 (.....).
- d Ahmed is now "**y**" years old. How old was he 3 years ago?
- e Ahmed shared a pizza pie equally with 4 of his friends, the share of each one of them is (.....).
- f **Bassem runs one kilometer in 15 minutes.**
 Write a mathematical expression that expresses the time Bassem needs to run "**t**" km.

Unit 3 Algebraic Expressions

Concept 3.2

Algebraic Expressions and Exponents

Lesson 4

1 Complete the following:

a $5 \times 5 \times 5 \times 5 = 5^{\quad}$

b $4 \times 4 \times 4 = 4^{\quad}$

c $3 \times 3 \times 3 \times 3 \times 3 = \dots^5$

d $8 \times 8 \times 8 = \dots^3$

e $2 \times 2 \times 2 \times 2 = \dots$

f $6 \times 6 \times 6 = \dots$

g $7^2 = \dots \times \dots$

h $6^4 = \dots \times \dots \times \dots \times \dots$

i $10^2 = \dots \times \dots$

j $1^5 = \dots \times \dots \times \dots \times \dots \times \dots$

k $5^3 = \dots \times \dots \times \dots$

l $2^2 = \dots \times \dots$

2 Find the value of:

a $5^2 = \dots$

b $3^3 = \dots$

c $2^5 = \dots$

d $1^4 = \dots$

e $1^3 = \dots$

f $10^3 = \dots$

g $0^2 = \dots$

h $0^3 = \dots$

i $1^8 = \dots$

j $1^{10} = \dots$

k $6^0 = \dots$

l $9^0 = \dots$

3 Follow the **order of performing operations** to find the value of each of the following:

a $4 + 5 \times 6$

=

=

b $18 - 12 \div 3$

=

=

c $15 \div 3 + 7$

=

=

d $7 \times 7 - 24$

=

=

e $9 + 9 - 8$

=

=

f $15 - 3 + 7$

=

=

g $6 \times 6 \div 4$

=

=

h $48 \div 8 \times 2$

=

=

i $5 \times 2 + 3 \times 4$

=

=

4 Follow the **order of performing operations** to find the value of each of the following:

a $(3 + 6) \times 2$

= _____

= _____

b $15 \div (2 + 3)$

= _____

= _____

c $8 \times (12 \div 4)$

= _____

= _____

d $[3 \times (9 - 4)] - 10$

= _____

= _____

= _____

e $5 \times [12 \div (4 + 2)]$

= _____

= _____

= _____

5 Follow the **order of performing operations** to find the value of each of the following:

a $4^2 + 2 \times 3$

= _____

= _____

b $2^4 - 3^2$

= _____

= _____

c $10^2 \div 5$

= _____

= _____

d $45 - 6^2$

= _____

= _____

e 3×1^3

= _____

= _____

f $48 \div 4^2$

= _____

= _____

g $3 \times 2^3 \div 12$

= _____

= _____

= _____

h $8 + 5^2 - 30$

= _____

= _____

= _____

i $2 \times 10^2 + 15$

= _____

= _____

= _____

j $2^2 \times 3 - 10$

=
=
=

k $6^2 \div 9 + 5$

=
=
=

l $4^3 + 2 \times 5$

=
=
=

6 Follow the **order of performing operations** to find the value of each of the following:

a $4^2 + (15 - 7) \times 2$

=
=
=

b $(2^5 + 3) \div (2^3 - 1)$

=
=
=

c $3 \times [5^2 - (4 \times 6)]$

=
=
=

d $[5^2 \times (6^2 \div 9)] - 24$

=
=
=

7 Complete the following:

a In 5^7 and 5 is called and 7 is called

b In, 4 is called the base and 2 is called the exponent.

c Six cubed =

d Seven squared =

e Four to the power of 5 =

f to the power of = 6^4

g If $3^x = 81$, then the value of x is

h If $y^3 = 64$, then the value of y is

8 Choose the correct answer:

a $4^2 =$

(4×2 or 4×4 or $4 + 2$ or $4 + 4$)

b $3^0 =$

(3 or 0 or 1 or 3×0)

c $1^5 =$

(1×5 or $1 + 5$ or 1 or 0)

d $2 \times 2 \times 2 \times 2 \times 2 =$

(2^5 or 5^2 or 2×5 or $2 + 5$)

e $5 \times 5 \times 5 =$

(3^5 or 5^3 or $5 + 3$ or 5×3)

f $4^{\text{.....}}$ = 1

(0 or 1 or 2 or 5)

g $5^{\text{.....}}$ = 5

(0 or 1 or 2 or 5)

h $3^4 =$

($4 \times 4 \times 4$ or $3 \times 3 \times 3 \times 3$ or 3×4 or $3 + 4$)

i 2^4 4^2

($<$ or $=$ or $>$ or $\geq$)

j 3^2 2^3

($<$ or $=$ or $>$ or $\geq$)

k $5 \times 3 + 2^2 =$

(35 or 19 or 51 or 17)

l $2^3 \times (5^2 + 75) =$

(800 or 275 or 210 or 135)

m $3^2 + 3^2 + 3^2 =$

(3^6 or 9^2 or 3^3 or 9^6)

Assessment

on Lesson 4

1 Choose the correct answer:

a $3^2 =$ _____ (3 + 3 or 2 + 2 + 2 or 3 × 3 or 3 × 2)

b $3^0 =$ 3 (0 or 1 or 3 or 10)

c 4^2 2^4 (< or = or > or ≤)

d $5^2 + 2^2 \times 10^2 =$ _____ (425 or 2,900 or 129 or 410)

e $(3^3 - 3^2) \div 3^2 =$ _____ (26 or 9 or 0.5 or 2)

2 Complete the following:

a $5^0 =$ 1

b $7^0 =$ 7

c $2^0 =$ 8

d $3 \times 3 \times 3 \times 3 \times 3 = 3^0$

e $6^2 \div 3^2 \times 2 =$ _____

3 Follow the order of performing operations to find the value of each of the following:

a $(15 - 9) + 3 \times 4^2 \div 2$
 = _____
 = _____
 = _____

b $8 + 2 \times (6 - 2) \div 2^3$
 = _____
 = _____
 = _____

c $[3^2 \times (8 - 5)] \div 3$
 = _____
 = _____
 = _____

d $5^2 + (48 \div 2^3) - 15$
 = _____
 = _____
 = _____

Lessons 5-7

1 Write the **algebraic expression** that represents each of the following situations:

a If the price of one pen is 8 pounds, what is the price of " x " pens?
(.....)

b If the price of a juice can is 12 pounds, what is the price of " y " juice cans?
(.....)

c Salah saves " z " pounds per day. How much does he save in a week?
(.....)

d A restaurant provides meals. The price of one meal is 50 pounds, and 15 pounds are added to the home delivery service, regardless of the number of meals required.

What is the total amount paid when ordering " m " meals?
(.....)

e Hussam trains for " n " hours daily for 6 days of the week, and on Friday he trains for 3 hours. How many hours does Hossam spend training in one week?
.....

f Wafaa has 300 pounds. She bought 9 pens of the same type. The price of one pen is " p " pounds. What is the amount left with Wafaa after buying the pens?

g Hana has 3 boxes of pens, each with " q " pens, and she wants to divide these pens among 6 children.

How many pens will each child get?

2 Find the value of the algebraic expression in each of the following:

a $6x + 15$ [for $x = 3$]

=
=
=

b $25 - 3y$ [for $y = 8$]

=
=
=

c $9z - 15$ [for $z = 2.1$]

=
=
=

d $4a - 15 \div 3$ [for $a = 2.5$]

=
=
=

e $(6b - 3) \div 7$ [for $b = 4$]

=
=
=

f $18 \div (9 - 2c)$ [for $c = 1.5$]

=
=
=

3 Find the value of the algebraic expression in each of the following:

a $d^3 + 7$ [for $d = 3$]

=
=
=

b $37 - 4^e$ [for $e = 2$]

=
=
=

c $f^5 - 21$ [for $f = 2$]

=
=
=

d $g^2 - 32 \div 8$ [for $g = 5$]

=
=
=

$$\text{e } (h^2 - 1) \div 5 \quad [\text{for } h = 6]$$

=

=

=

$$\text{f } 16 \div (20 - n^2) \quad [\text{for } n = 4]$$

=

=

=

$$\text{g } m^2 + m^3 - 15 \quad [\text{for } m = 3]$$

=

=

=

$$\text{h } k^2 \times (k - 5) \quad [\text{for } k = 5]$$

=

=

=

4 Find the value of the algebraic expression in each of the following:

$$\text{a } 15 + 3x - x^2 \quad [\text{for } x = 4]$$

=

=

=

$$\text{b } y^3 - 5y \div 3 \quad [\text{for } y = 3]$$

=

=

=

$$\text{c } 6a \div (a^2 - 10) \quad [\text{for } a = 5]$$

=

=

=

$$\text{d } 3b + 6 \times (b^2 - 3) \quad [\text{for } b = 2]$$

=

=

=

5 In a car park, 10 pounds are collected for parking the car for the first hour, and 5 pounds are added for every hour after the first hour.

a Write an algebraic expression that expresses the amount collected for parking the car for " h " hours after the first hour. (.....)

b If the number of hours the car waited for is 6 hours, what is the value of the amount collected for parking the car?

6 Hala receives a daily wage of “ p ” pounds. If her expenses in 10 days amounted to 325 pounds:

- a Write an algebraic expression for the amount remaining with her in the 10 days. (.....)
- b If Hala’s wages are 50 Egyptian pounds per day, how much money is left with her?

7 Evaluate each of these algebraic expressions using two positive integers of your choice. If the algebraic expressions are equal, write yes. If the algebraic expressions are not equal, write no.

a	$x + 3x$	$3(x + 1)$	Equal or Not?
If $x =$			
If $x =$			

From the previous table, we find that the two algebraic expressions are (equivalent or not equivalent).

b	$5x + 5$	$5(x + 1)$	Equal or Not?
If $x =$			
If $x =$			

From the previous table, we find that: the two algebraic expressions are (equivalent or not equivalent).

Assessment on Lessons 5-7

1 Choose the correct answer:

- a If the price of one shirt is 120 Egyptian pounds, then the price of " m " number of shirts is

($120m$ or $120 \div m$ or $120 + m$ or $120 - m$)

- b If Hanan saves " d " pound daily for 5 days, then her father gives her 20 pounds, then the amount that Hanan has now is

($5 + 20d$ or $20 - 5d$ or $5d + 20$ or $5 \times (d + 20)$)

- c The value of the expression $a^2 + 2 \times 3$ when $a = 3$ is

(15 or 33 or 12 or 24)

- d The value of the expression $12 \div (16 - 3b)$ when $b = 4$ is

(4 or 3 or 26 or 10)

- e Which of the following order of operations is used to find the value of the expression $8 + 2 \times (n^2 - 3)$ when $n = 5$?

(Putting the exponent in its simplest form, subtraction, multiplication, and addition)

or Addition, multiplication, exponentiation in simplest form, and subtraction

or Putting the exponent in its simplest form, addition, subtraction, and multiplication

or Putting the exponent in its simplest form, multiplication, addition, and subtraction)

- f If the side length of a square is " s " cm, then the perimeter of the square
 = ($4s$ or $4 + s$ or $s \times s$ or $8s$)

2 Answer the following:

- a Find: the value of the expression $9x$ (when $x = 5$).

.....

- b Find: the value of the expression r^2 (when $r = 9$).

.....

- c Find the algebraic expressions $2x + 3$ and $2(x + 1)$ are
 expressions. (equal or not equal)

- d Find the value of the expression $3 \times (y^2 - 5)$ (when $y = 3$).

.....

- e Fouad studies for " k " hours a day for 5 days, then studies for 6 hours on the sixth day.

- 1 Write an algebraic expression for the number of hours he studies in the 6 days. (.....)

- 2 If the number of hours he studies in each of the five days is 4 hours, how many hours did he study in the 6 days?

.....



Assessment on Unit 3

First: Choose the correct answer:

- 1 The coefficient of the algebraic term " $-3ab$ " is (-3 or 3 or a or ab)
- 2 The number of terms that makes up the algebraic expression " $3xy + 2x - 5$ " is terms. (2 or 3 or 4 or 5)
- 3 The constant term in " $3m + 2$ " is (2 or 3 or m or $3m$)
- 4 Subtracting the number 3 from twice the number y = ($3 - 2y$ or $2(y - 3)$ or $3y - 2$ or $2y - 3$)
- 5 Samah is now 25 years old. How old was she h years ago? ($25 - h$ or $h - 25$ or $25 - h$ or $25h$)
- 6 $5 \times 5 \times 5 =$ (5×3 or 5^3 or 3^5 or $5 + 3$)
- 7 $3^2 + 4$ $9 + 2^2$ ($>$ or $=$ or $<$ or $\leq$)
- 8 If the price of one book is 15 pounds, what is the price of b number of books? ($15b$ or $15 - b$ or $b - 15$ or $b + 15$)
- 9 The order that is used to find the value of $2 + 3(m^2 - 5)$ if $m = 3$ is
(putting exponents in their simplest form, subtraction, multiplication, and addition
or addition, exponents, subtraction, and multiplication
or putting the exponents in the simplest form, addition, subtraction, and multiplication
or multiplication, addition, exponents in simplest form, and subtraction)

Second: Answer the following:

- 1 If the sum of two integers is S and one of them is 10, what is the other number?
- 2 What are the like terms for " $3n + 3 + 2n$ "?

3 Write the verbal form of " $3x - 5$ ":

4 Ahmed's car consumes " n " liters of fuel to travel a distance of 100 km. How many liters does the car need to travel a distance of 600 km?
.....

5 Find: the value of " $4 \times (y^3 - 7)$ " for $y = 3$.
.....

6 Moataz saved " n " pounds per day for 9 days, then he got 20 pounds from his father.

a Write an algebraic expression that expresses the amount that Moataz has now:

b Complete using the preceding algebraic expression:

① The number of terms of the algebraic expression is

② The coefficients are

③ The constants are

7 Find the value of each of the following two algebraic expressions using the numbers shown, then indicate if these expressions are equivalent or not:

	$2x + 1$	$5x - 4$	Equal or Not?
If $x = 5$			
If $x = 3$			

From the previous table, we find that the two algebraic expressions are (equivalent or not equivalent).



ACCUMULATIVE ASSESSMENT

on Units 1-3

First: Choose the correct answer:

- 1 The coefficient of the algebraic term " $\frac{3}{4}x$ " is (3 or 4 or $\frac{3}{4}$ or x)
- 2 If we subtract 9 from the number x , the result is
($x + 9$ or $x - 9$ or $9 - x$ or $9x$)
- 3 $| - 3.7 | =$ (3.7 or -3.7 or 37 or -37)
- 4 $2 \times 2 \times 2 =$ (2^3 or 3^2 or 2×3 or $2 + 3$)
- 5 $2^3 + 2^3 =$ (2^6 or 4^3 or 2^4 or 4^6)
- 6 is the smallest prime number. (0 or 1 or 2 or 3)
- 7 The smallest positive integer is (1 or 0 or -1 or 2)
- 8 The number of terms in the algebraic expression $5y - 25z$ is (2 or 4 or 5 or 1)
- 9 If the price of a pen is 8 LE, then the price of x pens is
($8 + x$ or $x - 8$ or $8 \div x$ or $8x$)

Second: Answer the following:

- 1 Write the verbal form of the algebraic expression $3b + 4$.
.....

- 2 Follow the order of performing operations to find:

a $4^2 + (2^4 - 7) \times 2$

=
=
=

b $(2^3 + 6) \div (3^2 - 2)$

=
=
=

- 3 Wael collected $3\frac{3}{4}$ kilograms of dates, and gave $2\frac{1}{5}$ kilograms to his friend.
How many kilograms does Wael have left?
.....

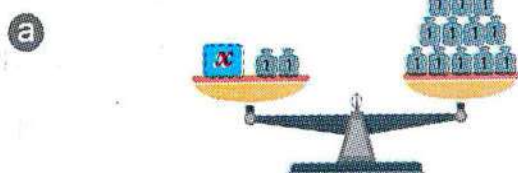
Unit 4 Equations and Inequalities

Concept 4.1

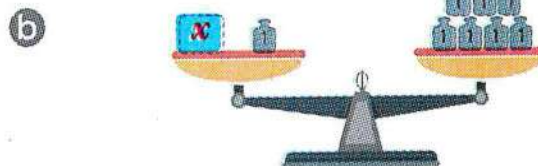
Write and Solve Equations and Inequalities

Lesson 1

- 1 Write the **equation** that represents each of the following models, and then find the value of " x ":



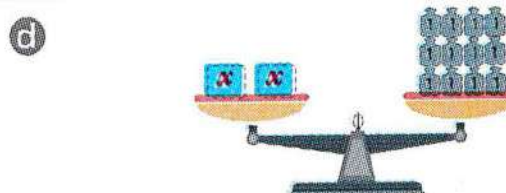
Equation: _____
 $x =$ _____



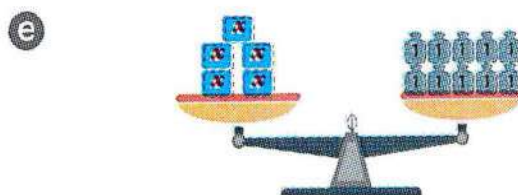
Equation: _____
 $x =$ _____



Equation: _____
 $x =$ _____



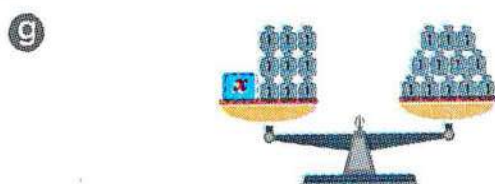
Equation: _____
 $x =$ _____



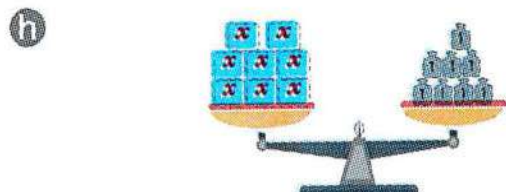
Equation: _____
 $x =$ _____



Equation: _____
 $x =$ _____



Equation: _____
 $x =$ _____



Equation: _____
 $x =$ _____

2 Find the **value** of the **variable** in each of the following equations (solve the equation):

a $x + 9 = 12$

b $y + 6 = 11$

c $3 + b = 5$

d $a - 6 = 8$

e $6m = 24$

f $3n = 21$

g $\frac{s}{4} = 3$

h $\frac{1}{5}t = 4$

3 Complete the following:

a If $x + 3 = 8$, then $x =$

b If $y - 2 = 9$, then $y =$

c If $8m = 16$, then $m =$

d If $\frac{1}{3}n = 3$, then $n =$

e If $a = 3$, then $a +$ = 7.

f If $b = 5$, then $b -$ = 2.

g If $d = 4$, then $\times d = 20$.

h If $k = 12$, then $k \div$ = 4.

Assessment

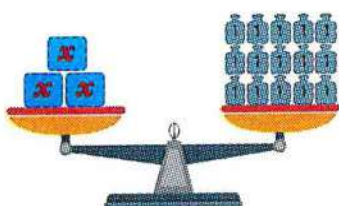
on Lesson 1

1 Choose the correct answer:

- a If $a + 8 = 15$, then $a =$ (7 or 15 or 8 or 23)
- b If $b = 6$, then $b -$ = 4. (10 or 4 or 2 or 6)
- c If $6x = 42$, then $x =$ (38 or 42 or 7 or 48)
- d If $y = 27$, then $\frac{y}{\text{.....}} = 9$. (18 or 3 or 27 or 9)
- e If $4n = 12$, then $6n =$ (4 or 12 or 18 or 3)

2 Write the equation that represents each of the following models, and then find the value of "x":

a



Equation:

$x =$

b



Equation:

$x =$

3 Find the value of the variable in each of the following equations (solve the equation):

a $x + 2 = 7$

.....
.....

b $y - 3 = 8$

.....
.....

c $3a = 21$

.....
.....

d $\frac{n}{5} = 35$

.....
.....

Lessons 2&3

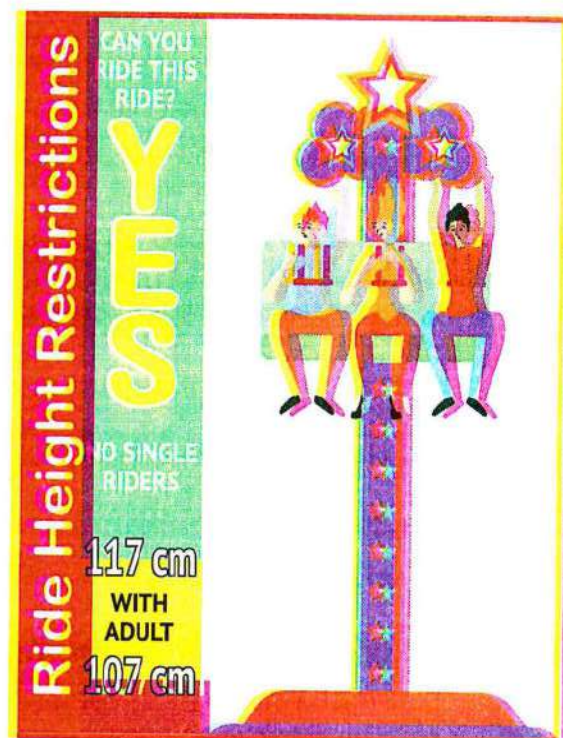
- 1 The opposite sign shows the height limits for an amusement park ride.

a List **three acceptable** heights for a person to be able to ride the roller coaster.

..... ; ;

b List **three unacceptable** heights for a person to not be able to ride the roller coaster.

..... ; ;



- 2 The opposite sign shows the weight limits for vehicles stowed (stored) on a ramp and vehicles transiting (traveling across) the ramp. Answer these questions.

a Suppose **3** vehicles are stowed on the ramp at the same time.

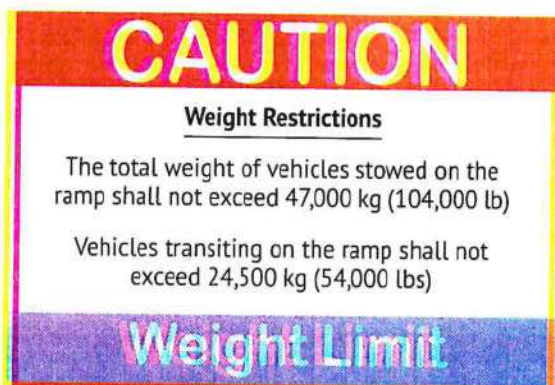
What are some possible weights of the 3 vehicles?

..... ; ;

b Now, suppose **3** vehicles are traveling across the bridge.

What are some possible weights of the 3 vehicles?

..... ; ;



3 Write the **inequality** that represents each of the following expressions:

- a All values greater than -1 :
- b All values less than 2 :
- c All values to the right of -9 on the number line are:
- d All values to the left of the number 2 on the number line are:
- e All values greater than or equal to 6 :
- f All values less than or equal to -8 :
- g Negative integers:
- h Positive integers:
- i Natural numbers:
- j Counting numbers:
- k Non-negative integers:
- l Non-positive integers:

4 Write what each of the following inequalities represents:

- a $x > 9$ $\rightarrow$ All values
- b $x > -5$ $\rightarrow$ All values
- c $x < 2$ $\rightarrow$ All values
- d $x < -7$ $\rightarrow$ All values
- e $x \leq -3$ $\rightarrow$ All values
- f $x \leq 4$ $\rightarrow$ All values
- g $x \geq 3$ $\rightarrow$ All values
- h $x \geq 0$ $\rightarrow$ All values

5 Determine whether each of the given values is a solution to $x < 9$. Record **all the values** that are solutions:

a -9

b 10

c 0

d 2.4

e 9.1

f -0.9

g 8.9

h -6

i 15

6 Name **3** solutions of each inequality in the set of integers.

a $x < 3$

b $x \geq 1$

c $2x < 5$

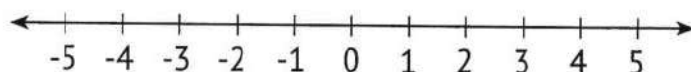
d $x + 1 < 5$

e $3x \leq 12$

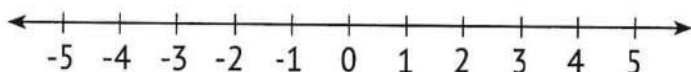
f $x - 2 < 7$

7 Use the number line to represent each of the following **inequalities** in the **set of integers**:

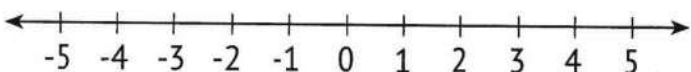
a $x > -1$



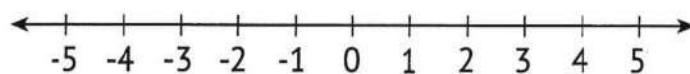
b $x \geq -1$



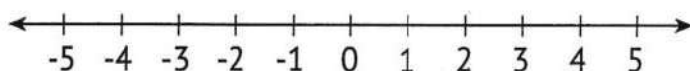
c $x < 2$



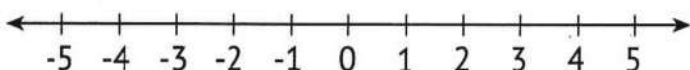
d $x \leq 2$



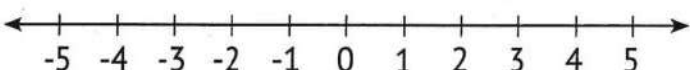
e $x > 3$



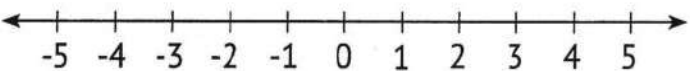
f $x \geq 3$



g $x < 0$



h $x \leq 0$



8 Choose the correct answer:

a The inequality that represents all values greater than -1 is ($x > -1$ or $x < -1$ or $x \leq -1$ or $x \geq -1$)

b The inequality that represents all values to the left of 5 on the number line is ($x > 5$ or $x < 5$ or $x \leq 5$ or $x \geq 5$)

c The inequality that represents all values less than or equal to -7 is ($x > -7$ or $x < -7$ or $x \leq -7$ or $x \geq -7$)

d The inequality that represents all values to the right of 3 on the number line is ($x > 3$ or $x < 3$ or $x \leq 3$ or $x \geq 3$)

e The inequality that represents negative integers is ($x > 0$ or $x < 0$ or $x \leq 0$ or $x \geq 0$)

f The inequality that represents non-positive integers is
 ($x > 0$ or $x < 0$ or $x \leq 0$ or $x \geq 0$)

g The graphs of the inequalities $x > 3$ and $x < 3$ on a number line are similar in that
 (3 does not belong to the solution set in each of them

or both include all values to the left of 3

or there is a common point between them

or each of them includes all the values to the right of 3)

h The graphs of the inequalities $x < 4$ and $x \leq 4$ on a number line are similar in that
 (4 does not belong to the solution set in each of them

or each including all values to the left of 4

or there is a common point between them

or each of them includes all the values to the right of the number 4)

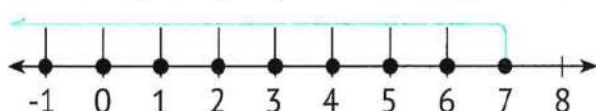
i Which of the following values is a solution to the inequality $x < 9$?

(10 or 9.1 or -9.5 or 9)

j Which of the following values is a solution to the inequality $x \geq 5$?

(-5 or 4.59 or -25 or 6)

k The inequality represented by the following graph is



($x > 7$ or $x < 7$ or $x \leq 7$ or $x \geq 7$)

9 How similar are the graphs of the following pair of algebraic expressions? And what is the difference?

a $x < -8$ and $x \leq -8$

① The similarity

.....

② The difference

.....

b $x \geq -8$ and $x \leq -8$

① The similarity

② The difference

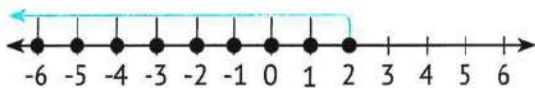
c $x = -8$ and $x > -8$

① The similarity

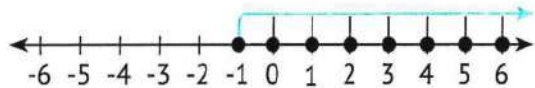
② The difference

10 Write the **inequality** represented by each of the following number lines in the **set of integers**:

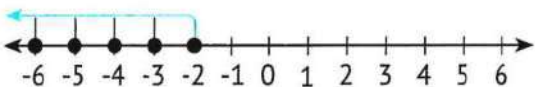
a



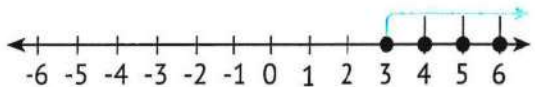
b



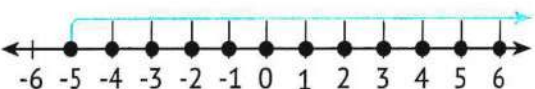
c



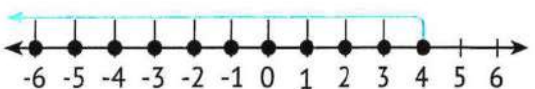
d



e



f



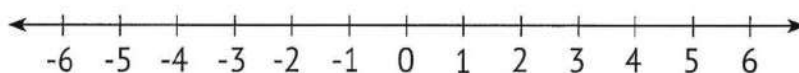
Assessment on Lessons 2&3

1 Choose the correct answer:

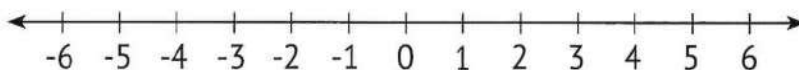
- a The inequality representing the statement "All values greater than -5 " are
 ($x > -5$ or $x < -5$ or $x \leq -5$ or $x \geq -5$)
- b The statement that represents the inequality $x < 3$ is: All values 3.
 (greater than or less than or greater than or equal to, less than or equal to)
- c The inequality that represents the statement "All values to the right of 0" on a number line are
 ($x > 0$ or $x < 0$ or $x \leq 0$ or $x \geq 0$)
- d Which of the following values is a solution to the inequality $x < -2$?
 (0 or 1.5 or -3 or -2)
- e Which of the following values is not a solution to the inequality $x > -1$?
 (1 or 0 or -2 or -0.5)

2 Represent each of the following inequalities on a number line (In the set of integers):

a $x > -4$

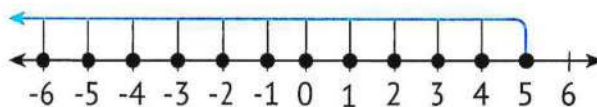


b $x \leq 0$

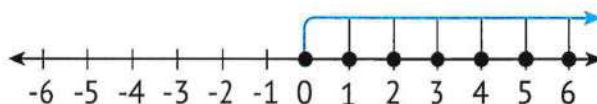


3 Write the inequality represented by each of the following number lines (In the set of integers):

a



b





Assessment on Unit 4

First: Choose the correct answer:

1 If $a + 3 = 7$, then $a =$ (7 or 3 or 10 or 4)

2 If $b = 6$, then $b -$ = 2. (4 or 8 or 2 or 3)

3 If $5x = 40$, then $x =$ (35 or 45 or 8 or 200)

4 If $y = 6$, then $\frac{y}{\text{.....}} = 2$. (3 or 8 or 12 or 4)

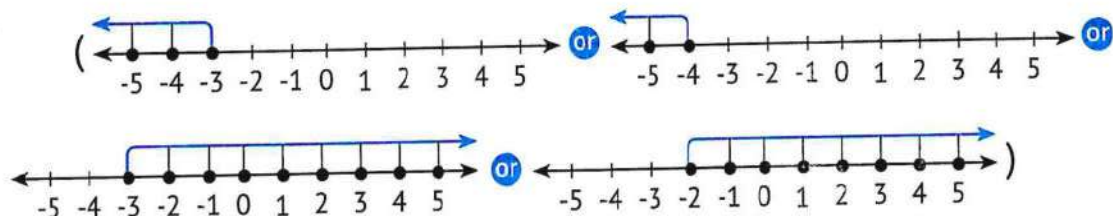
5 The inequality that represents all values "greater than 4" is
($x > 4$ or $x < 4$ or $x \leq 4$ or $x \geq 4$)

6 The inequality that represents all values
"less than or equal to -2" is ($x > -2$ or $x < -2$ or $x \leq -2$ or $x \geq -2$)

7 The inequality that represents all negative numbers are
($x > 0$ or $x < 0$ or $x \leq 0$ or $x \geq 0$)

8 The inequality represented by
the corresponding graph is
($x > 4$ or $x < 4$ or $x \leq 4$ or $x \geq 4$)

9 The graph expressing the inequality " $x < -3$ " is



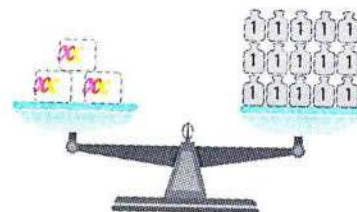
Second: Answer the following:

1 Complete all of the following:

a If $x + 7 = 9$, then $x =$ b If $4m = 20$, then $m =$

c If $b = 12$, then $b -$ = 8. d If $d = 3$, then $\times d = 18$.

2 What is the equation that represents the corresponding model?



3 Write the inequality that represents all values "greater than or equal to 3"

4 Write the inequality that represents all positive integers:

5 What are the similarities between the graphs of the two algebraic expressions $x = 9$ and $x \geq 9$?

6 Find the value of the variable in each of the following equations:

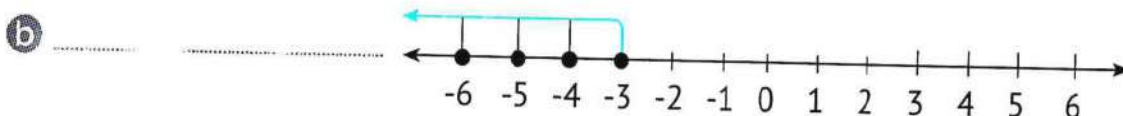
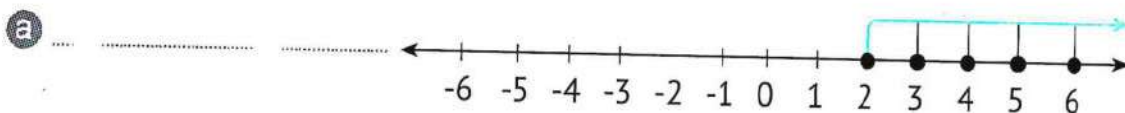
a $x - 5 = 4$

.....
.....

b $4x = 24$

.....
.....

7 Use the following number lines to write inequalities in the set of integers:



ACCUMULATIVE ASSESSMENT

on Units 1-4



First: Choose the correct answer:

- 1 The least common multiple of any two prime numbers is
(the greater number or 1 or their sum or their product)
- 2 The integer that expresses (The depth of a well of 8 meters) is
(-8 or 8 or $\frac{1}{8}$ or $-\frac{1}{8}$)
- 3 The number of terms that make up the algebraic expression " $5 + 2ab$ " is terms.
(2 or 3 or 4 or 5)
- 4 If Bassem is " x " years old now, how old will he be after 5 years?
($x - 5$ or $x + 5$ or $5 \div x$ or $5x$)
- 5 If " $a + 3 = 7$ ", then $2a =$
(10 or 4 or 8 or 20)
- 6 The GCF of the two relatively prime numbers is
(0 or 1 or 2 or their product)
- 7 The number " -3 " is the opposite of the number
(-3 or 3 or 0 or 1)
- 8 The absolute term in the algebraic expression $7x + 1$ is
(7 or x or 1 or $7x$)

Second: Answer the following:

- 1 $8 \times (\dots + \dots) = (\dots \times 9) + (\dots \times 2)$
- 2 Write the inequality that represents all values less than -6 :
- 3 Write a numerical expression to represent the greatest number of equal groups that can be formed from 12 boys and 18 girls, with each group containing the same number of boys and the same number of girls.

4 Solve each of the following equations:

a $x - 4 = 8$

b $3y = 24$

Theme

2

Mathematical Operations and Algebraic Thinking (Statistics and Data Analysis)

Theme Units

Unit

5

**Dependent and
Independent Variables**

Concept 5.1: Explore Relationships
Between Two Variables

Unit

6

Data Distributions

Concept 6.1: Applications on
Collecting and
Representing Data

Unit

7

**Measures of
Central Tendency
and Spread**

Concept 7.1: Exploring Measures of
Central Tendency and
Spread

Unit 5 Dependent and Independent Variables

Concept 5.1

Explore Relationships Between Two Variables

Lessons 1&2

- 1 Determine the **independent** variable and the **dependent** variable in each of the following situations:

a	The money you spend (Independent or Dependent)	and	The types of games you like (Independent or Dependent)
b	The menu (Independent or Dependent)	and	What you order from the food stall (Independent or Dependent)
c	How much you laughed (Independent or Dependent)	and	How funny the joke was (Independent or Dependent)
d	The number of cars in the garage (Independent or Dependent)	and	The area of the garage (Independent or Dependent)
e	The number of students participating in the trip (Independent or Dependent)	and	The number of supervisors (Independent or Dependent)
f	The number of days of going to the club (Independent or Dependent)	and	The number of training hours (Independent or Dependent)
g	The amount of food you eat (Independent or Dependent)	and	The amount of weight gain (Independent or Dependent)
h	The speed of the vehicle (Independent or Dependent)	and	The distance traveled in one hour (Independent or Dependent)
i	The money you have (Independent or Dependent)	and	The number of pens you can buy (Independent or Dependent)

2 Determine the independent variable and the dependent variable in each of the following relationships:

a	Relationship	$e = 8 - r$	$\frac{s}{3} = b$	$z + 5 = m$	$y = 5x$
	Independent Variable				
	Dependent Variable				

b	Relationship	$2a = b$	$f = t + 4$	$p - 3 = z$	$3m = w$
	Independent Variable				
	Dependent Variable				

3 If the price of one pen is 9 pounds, complete:

- The equation that represents the relationship between the number of pens (x) and the purchase price (y) is:
- The independent variable is
- The dependent variable is
- The price of 6 pens is:

4 If 15 pounds will be added for the delivery of fast food meals in a restaurant, complete:

- The equation that represents the relationship between the prices of meals (x) and the amount to be paid including delivery (y) is:

- b The independent variable is
- c The dependent variable is
- d The required amount if the price of the meal is 120 pounds is

5 If Hazem owns a discount card of 50 pounds, complete :

- a The equation that represents the relationship between Hazem's purchases amounted (x) pounds, and the amount to be paid after the discount (y) pounds is
- b The independent variable is
- c The dependent variable is
- d The required amount if the purchase price before the discount is 420 pounds is:

6 Speed of a car = Distance $\div$ Time. If the time is 3 hours, complete:

- a The equation representing the relationship between the distance (x) and the speed (y) is
- b The independent variable is
- c The dependent variable is
- d Calculate the speed in each of the following cases, such that the time is constant (3 hours):

Distance (km)	420	360	270	210	180
Speed (km per hour)	.....	.....	.....	.....	.....

7 Complete the following

- a In the equation $8x = y$, the independent variable is
- b In the equation $m - 8 = a$, the dependent variable is
- c If the prices of books depend on the number of books purchased, then:
 - 1 The independent variable is
 - 2 The dependent variable is
- d If the number of baked goods depends on the amount of flour used, then:
 - 1 The independent variable is
 - 2 The dependent variable is
- e If the independent variable is what Ahmed saves each month and the dependent variable is what he saves in a whole year, then
depends on

Assessment

on Lessons 1&2

1 Choose the correct answer:

- a In " $u = 3 \div w$ ", the independent variable is (w or u or 3 or $\frac{w}{3}$)
- b In " $a = 5d$ ", the dependent variable is (5 or a or d or $5d$)
- c If the amount of fuel consumed by the car depends on the distance traveled, then the independent variable is the
(fuel amount or distance traveled or time traveled or temperature)
- d If the dependent variable is the student's score in the exam, then the independent variable is
(the type of pen used in the solution or the age of the student or the number of correct answers or the number of questions in the exam)

2 Diaa saves 150 pounds every month. If the amount he saves in (x) month(s) is (y) pounds, then

- a The equation that represents this situation is
- b The independent variable is, and the dependent variable is
- c What Diaa saves in a year is

3 The value of one student's participation in a school trip is 90 pounds. If the number of participating students is (x) and the total participation value for all students is (y) , complete:

- a The equation that represents this situation is
- b The independent variable is
- c The dependent variable is
- d If the number of participants is 35, then the total of participation value is

Lesson 3

- 1 Complete the following using variables " x " and " y ", where " x " is an independent variable:

	Rule	Equation
a	.....	$y = x + 4$
b	.....	$y = x - 7$
c	Multiply by 5.	.....
d	Divide by 7.	.....
e	.....	$y = 2x + 3$
f	.....	$y = x \div 2 + 4$
g	Add 7, and then multiply by 2.	.....
h	Add 6, then divide by 3.	.....
i	Multiply by 5, then subtract 2.	.....
j	Divide by 4, then subtract 3.	.....
k	.....	$y = (x - 2) \times 4$
l	.....	$y = (x - 9) \div 2$

- 2 Notice each table, identify the rule, and then complete the pattern:

a	Inputs (x)	9	10	7	.....	12
	Outputs (y)	4	5	2	0	.....

Rule:

Equation $y =$

b	Inputs (x)	3	2	.....	6	10
	Outputs (y)	9	6	12	.....	30

Rule:

Equation $y =$

c

Inputs (x)	2	3	4	5	.....
Outputs (y)	8	12	16	.....	24

Rule:

Equation: $y =$

d

Inputs (x)	1	2	3	4	.....
Outputs (y)	8	13	18	.....	28

Rule:

Equation: $y =$

e

Inputs (x)	3	4	5	6	.....
Outputs (y)	3	6	9	.....	21

Rule:

Equation: $y =$

f

Inputs (x)	6	8	10	14	.....
Outputs (y)	0	1	2	.....	6

Rule:

Equation: $y =$

g

Inputs (x)	4	7	10	13	.....
Outputs (y)	1	2	3	.....	8

Rule:

Equation: $y =$

3 Complete the following statements using the variables " x " and " y ":

a If the rule is "add 3.1", then the equation is

If $x = 2.9$, then y will be:

b If the rule is "multiplication by 2", then the equation is

If $x = 8$, then y will be:

c If the rule is "divide by 3", then the equation is

If $x = 15$, then y will be

d If the rule is "subtraction from 8" then the equation is

If $x = 3.5$, then y will be

e If the rule equation is $y = 3(x + 5)$, then the rule is

If $x = 2$, then y will be

f If the equation is $y = (9 - x) \times 2$, then the rule is

If $x = 3$, then y will be

4 Choose the correct answer:

a The equation that expresses the rule "subtract from 9" is

($y = x - 9$ or $y = 9 - x$ or $y - x = 9$ or $y = 9x$)

b The equation that expresses the rule "multiply by 2 and then add 5" is
($y = 5x + 2$ or $y = 2(x + 5)$ or $y = 5(x + 2)$ or $y = 2x + 5$)

c The equation that expresses the rule "add 6 then multiply by 3" is

($y = 3x + 6$ or $y = 3(x + 6)$ or $y = 6x + 3$ or $y = (x + 3) \times 6$)

d The rule that represents the equation: $y = \frac{1}{3}x$ is

(divide by 3 or multiply by 3 or divide by $\frac{1}{3}$ or subtract $\frac{1}{3}$)

e The rule that represents the equation: $y = (x - 3) \div 2$ is

(divide by 2, then subtract 3 or subtract 3, then divide by 2

or divide by 3, then subtract 2 or subtract 2, then divide by 3)

f The rule that represents the equation: $y = 5x - 2$ is

(multiply by 2, then subtract 5 or subtract 2, then multiply by 5

or multiply by 5, then subtract 2 or subtract 5, then multiply by 2)

g If $y = 6x + 4$ and $x = 3$, then $y =$

(10 or 22 or 18 or 67)

h If $y = \frac{1}{4}x - 2$ and $x = 8$, then $y =$

(0 or 2 or 6 or 30)

i The equation that represents the corresponding table is

x	1	3	5
y	4	8	12

($y = x + 3$ or $y = 4x$ or $y = (x + 1) \times 2$ or $y = 2x + 2$)

Assessment on Lesson 3

1 Choose the correct answer:

a The equation that expresses the rule “add 4” is

($y = x + 4$ or $y = 4 - x$ or $y + x = 4$ or $y = 4x$)

b The rule that expresses the equation “ $y = 5x$ ” is:

(add 5 or multiply by 5 or divide by 5 or subtract 5)

c If $y = 2(x + 4)$ and $x = 5$, then $y =$ (11 or 29 or 18 or 14)

d The equation that expresses the rule “divide by 2, then add 5” is:

($y = 2x + 5$ or $y = \frac{1}{2}x + 5$ or $y = \frac{x + 5}{2}$ or $y = \frac{1}{5}x + 2$)

2 Complete the following table:

	Rule	Equation	Independent Variable	Dependent Variable	Input x	Output y
a	Add 4, then divide by 3.	.....	.....	.....	5	.....
b	Divide by 2, then subtract 1.	.....	.....	.....	8	.....
c	.....	$y = (x - 5) \times 2$	.....	.....	7	.....
d	.....	$y = 3x + 4$	.....	.....	.....	16

3 Use the equation “ $y = 2x + 3$ ” to complete the following table:

x	2	5	.....	.....	9	.....	3	8	.....
y	.....	.....	15	17	.....	5	.....	.....	11

Lesson 4

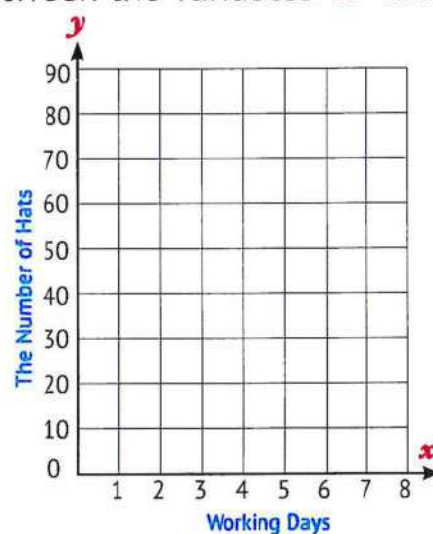
- 1 Omar manufactures hats, producing 10 hats per day.

Complete the following table representing the number of working days (x), and the number of hats produced (y).

Write an equation that shows the relationship between the variables " x " and " y ", and then represent it graphically.

x	1	2	4	.....
y	10	.....	.....	70
(x, y)	(.....,)	(.....,)	(.....,)	(.....,)

The equation is:



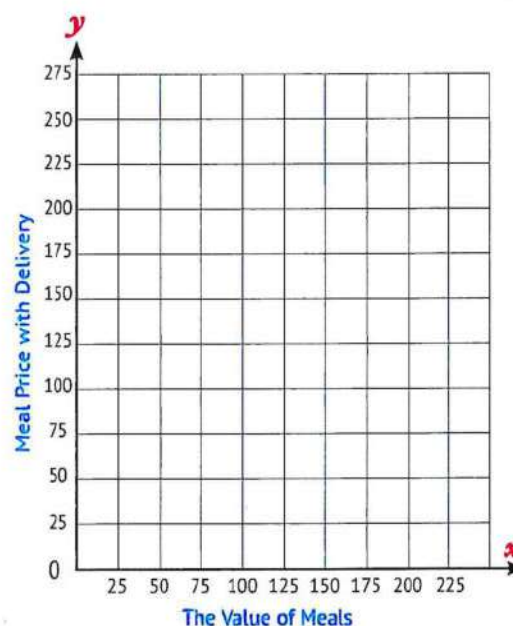
- 2 A restaurant adds 25 pounds for delivering ready-made meals to customers, regardless of the number of meals.

Complete the following table, where the variable " x " represents the value of the meals, and the variable " y " represents the value of the meals after adding the delivery amount.

Write an equation that shows the relationship between the variables " x " and " y ", and then represent it graphically

x	25	50	75	.....	.....
y	.....	.....	.....	125	150

The equation is:



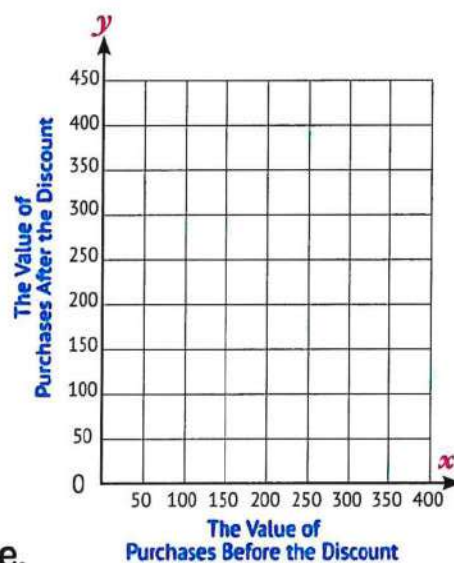
3 Nader has a 50-pound discount card at a clothing store.

Complete the following table, where the variable " x " represents the value of purchases before the discount, and the variable " y " represents the value of purchases after the discount.

Write an equation that shows the relationship between the variables " x " and " y ", and then represent it graphically.

x	150	200	300	.....
y	100	.....	.....	300
(x, y)	(.....,)	(.....,)	(.....,)	(.....,)

The equation is:



4 The school has 5 classes for the sixth grade.

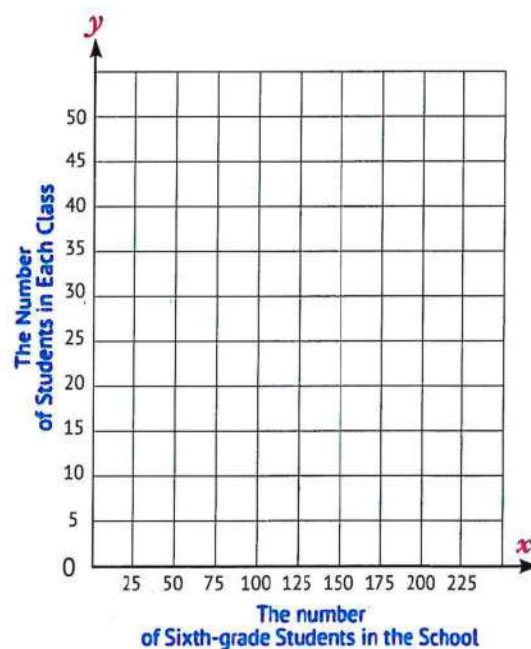
Complete the following table, where the variable " x " represents the number of sixth-grade students in the school.

The variable " y " represents the number of students in each class.

Write an equation that shows the relationship between the variables " x " and " y ", and then represent it graphically.

x	150	175	.....	.....
y	.....	.....	40	45

The equation is:

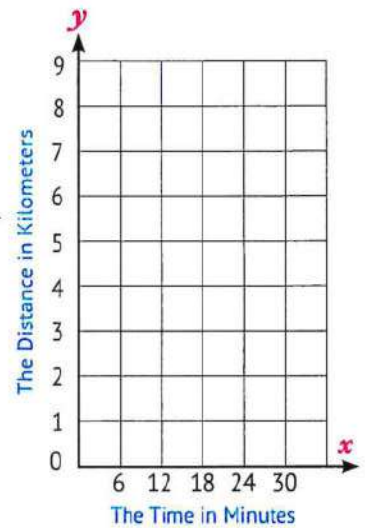


Assessment**on Lesson 4**

- 1 A cyclist on one wheel travels **two** kilometers in **12** minutes. Complete the following table, where the variable " x " represents the time in minutes, and the variable " y " represents the distance in kilometers.

x	6	12	.....	.....
y	.....	.....	3	4
(x, y)	(.....,)	(.....,)	(.....,)	(.....,)

The equation is:

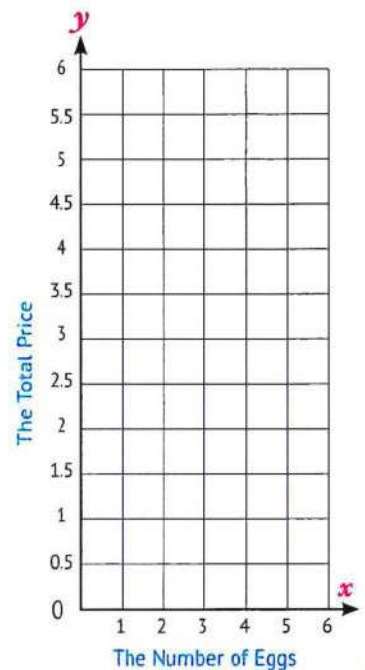


- 2 Hossam buys **4** eggs for **6** pounds.

Complete the following table, where the variable " x " represents the number of eggs, and the variable " y " represents the total price. Write an equation showing the relationship between the variables " x " and " y ", and then represent it graphically.

x	1	2	3	4
y	.....	.....	.....	.....
(x, y)	(.....,)	(.....,)	(.....,)	(.....,)

The equation is:





Assessment on Unit 5

First: Choose the correct answer:

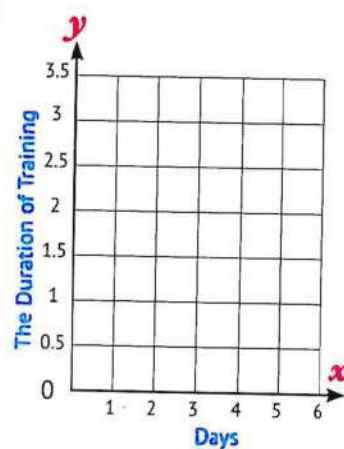
- 1 In the equation " $a = 3b$ ", the independent variable is
(a or b or 3 or $3b$)
- 2 In the equation " $m + 5 = r$ ", the dependent variable is
(m or 5 or r or $5m$)
- 3 If the independent variable is the number of studying hours, then the dependent variable is the (exam result or school uniform color or means of access to school or number of class students)
- 4 If the dependent variable is the number of training hours, then the independent variable is (the number of days you go to the club or the distance between the club and the house or the color of your training clothes or the height of the house)
- 5 The equation that expresses the rule "add 5, then multiply by 2" is
($y = 2x + 5$ or $y = 2(x + 5)$ or $y = 5x + 2$ or $y = (x + 2) \times 5$)
- 6 The rule that represents the equation " $y = (x - 8) \div 3$ " is
(divide by 8, then subtract 3 or subtract 8, then divide by 3 or divide by 3, then subtract 8 or subtract 3, then divide by 8)
- 7 If $y = 2x + 3$ and $x = 2.5$, then $y =$
(5 or 11 or 8 or 5.5)
- 8 If $y = 2(x + 4)$ and $x = 5$, then $y =$
(11 or 29 or 18 or 14)
- 9 If $y = 5x - 8$ and $x = 8$, then $y =$
(32 or 2 or 30 or 12)

Second: Answer the following:

- 1 In the equation " $8a = b$ ", what is the independent variable?
- 2 If the number of cars in the garage depends on the size of the garage, then:
 - a The independent variable is
 - b The dependent variable is
- 3 If the rule is "add 2.4":
 - a The equation is
 - b If $x = 4$, then $y =$
- 4 If the rule is "divide by 4":
 - a The equation is
 - b If $x = 16$, then $y =$
- 5 If the equation is $y = (15 + x) \div 4$:
 - a The rule is
 - b If $x = 5$, then $y =$

- 6 Sameh trains for 3 hours divided into 6 days equally:

Complete the following table, where the variable " x " represents the number of days, and the variable " y " represents the duration of training in hours. Write an equation that shows the relationship between the variables " x " and " y ", and then represent it graphically.



x	1	2	3	4	5	6
y						
(x, y)	(.....,)	(.....,)	(.....,)	(.....,)	(.....,)	(.....,)

The equation is:

ACCUMULATIVE ASSESSMENT

on Units 1-5

(6 or 15 or 20 or 12)

First: Choose the correct answer:

1 8 and are relatively prime numbers.

2 An integer between 2 and -2 is

3 The number m plus 18 and the result is divided by 3:

4 $3^4 =$
 ($m + \frac{18}{3}$ or $\frac{m}{3} + 18$ or $3 \div (m + 18)$ or $(m + 18) \div 3$)
 ($4 \times 4 \times 4$ or $3 \times 3 \times 3 \times 3$ or 3×4 or $3 + 4$)

5 If $y = 2$, then = 9.
 (18 or 3 or 27 or 9)

Second: Answer the following

1 Prime numbers less than 10 are

2 $\times (3 + 6) = (9 \times \text{.....}) + (9 \times \text{.....})$

3 Integers between -3 and 2 are

4 The opposite numbers on a number line have absolute values.
 (same or different)

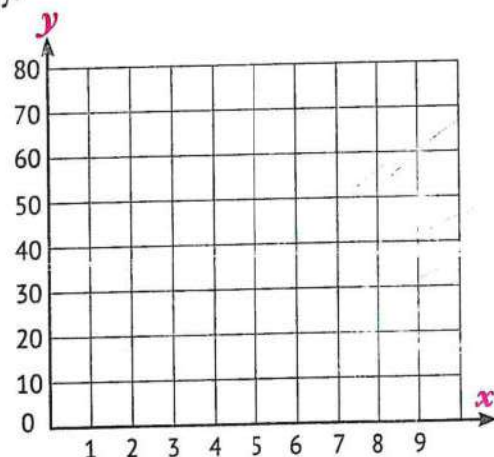
5 The value of the expression " $3 \times (y^2 - 5)$ " when $y = 3$ is

6 Omar manufactures hats, producing 10 hats per day. The following table represents the number of working days (x) and the number of hats produced (y).

Find the equation and represent it graphically.

x	2	4	6	8
y	20	40	60	80

The equation is:



Unit 6 Data Distributions

Concept 6.1

Applications on Collecting and Representing Data

Lesson

1

- 1 Select the type of each of the following questions:
(a statistical question or a non-statistical question)

Question	Statistical	Non-Statistical
a What is your favourite subject?		
b What is the most favourite color for the class students?		
c What is your name?		
d How many family members do you have?		
e How old are you ?		
f How many students are there in your school classes?		
g What is the most favorite sport for the class students?		
h Do you practice swimming?		
i How much money do students spend in a class per day?		
j What color are the eyes of the students in your class?		

- 2** Determine whether the results from each question would give you **numerical data** or **categorical data**.

	Question	Numerical Data	Categorical Data
a	How many students' families are in your class?		
b	What is the most favorite sport for the class students?		
c	What football teams do your students support?		
d	What is the monthly income of the employees of the most profitable companies?		
e	What are the heights of the students in your class?		
f	How many hours did the workers work in your father's factory?		
g	What are the blood groups of the students in your class?		
h	What are the weights of the students in your class?		
i	How many brothers and sisters does each of the students in your class have?		
j	What is the most favourite subject for the students in your class?		

3 Complete the following:

- a Types of questions are questions and questions.
- b Types of statistical data are data and data.
- c data is written in the form of numbers.
- d data is written in the form of words.
- e "What is your eyes' color?" is a question, while "what color are the eyes of the students in your class?" is a question.
- f "Do you like the red color?" is a question, while "what are the pupils' favorite colors?" is a question.
- g The monthly income of an institution's employees is a data.
- h The number of letters in each student's first name is a data.
- i The types of pens preferred by your class's students is a data.
- j The types of pets owned by the class's pupils are data, while the number of pets owned by the class pupils is a data.

4 Choose the correct answer:

- a A statistical question
(results in a lot of different answers or has a yes or no answer
or has one answer or has a one number as an answer)
- b are categorical data.
(Dates of birth or Ages or Weights or Favorite colors)
- c are/is categorical data.
(The number of students in each class or The number of family members
or Favorite TV shows or Test scores)
- d are numerical data.
(Preferred colors or Blood groups or Birthplaces or Ages)
- e are numerical data.
(Salaries or Favorite sports or Eye colors or Nationalities)
- f All of the following are categorical data, except
(favorite foods or occupations or weights or eye colors)
- g All of the following are categorical data, except
(marital statuses or heights or places of birth or skin color)
- h All of the following are numerical data, except
(temperatures or lengths or names or weights)
- i All of the following are numerical data, except
(types of pets or test scores or ages or number of pets)

on Lesson 1

1 Complete the following:

- Numerical statistical data are written in the form of
- Categorical statistical data are written in the form of
- "What is your favorite school subject?" is a question.
(statistical – non-statistical)
- "How many books do the students in your class read in a year?"
is a question. (statistical – non-statistical)
- The favorite colors of a number of pupils are data.
(numerical – categorical)

2 Complete the following table:

Question	Statistical		Non-Statistical
	Numerical	Categorical	
a What's your height?			
b What is your classmates' favorite sport?			
c Do you go jogging?			
d What football teams do your students support?			
e How many hours do you spend in school?			
f What are the weights of the students in your class?			
g How many family members does each of the students in your class have?			
h What subject do you prefer?			

Lessons 2&3

1 What is the best graph in the following situations?

(Dot Plot - Bar Graph - Histogram)

a How many students prefer the red color? (.....)

b How many students got marks in the exam from 15 to 20?
(.....)

c What is the number of pupils in each class of the school?
(.....)

d How many students in your class have a family of 5? (.....)

e How many Egyptian cities have a population of 2,000,000 to 3,000,000?
(.....)

f How many trees in the garden have a height of 3 to 4 meters?
(.....)

g How many passengers are on the first-class train? (.....)

h How many cities had a temperature of 40 degrees last summer?
(.....)

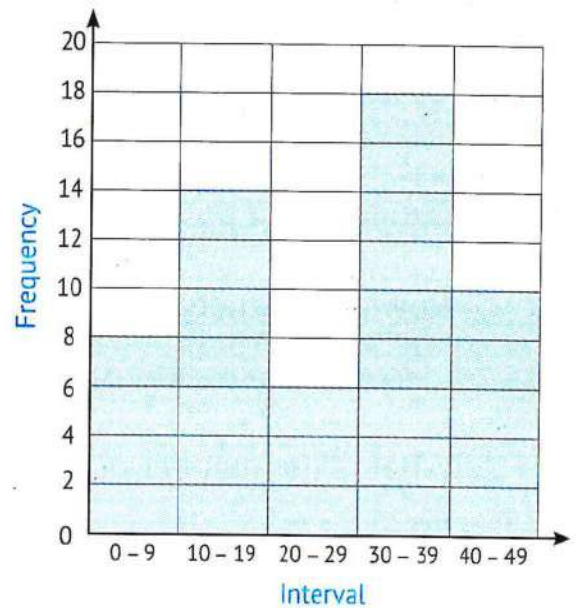
i How many students get 15 marks in the monthly exam?
(.....)

j How many students had 7–10 days of defective days during the past year?
(.....)

k How many students in your class are between 150 and 160 cm in height?
(.....)

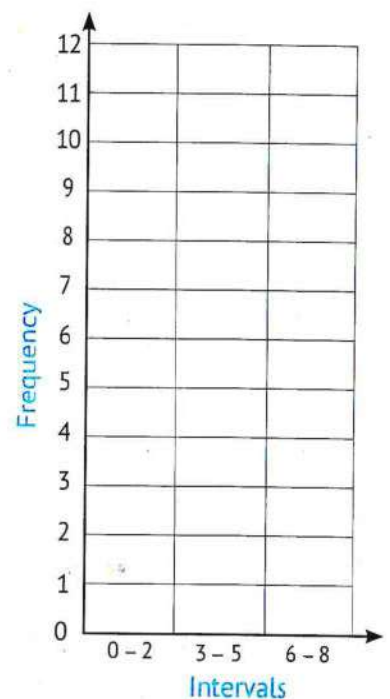
2 Complete the following **intervals** table using the histogram:

Intervals	Frequency
0 – 9	
10 – 19	
20 – 29	
30 – 39	
40 – 49	



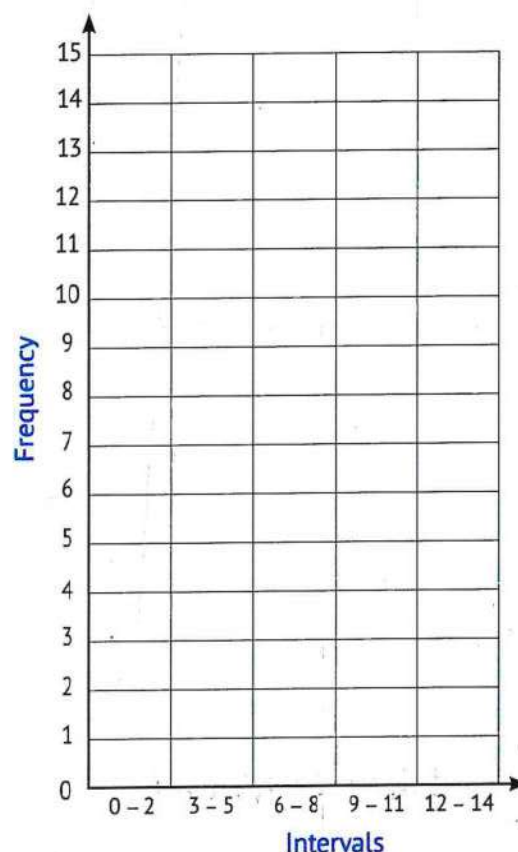
3 The following frequency table shows the number of days of absence for **26** students in the class during the first semester. Compose a table of intervals and then complete the graph:

Number of Days	Frequency	Intervals	Frequency
0	3	0 – 2	
1	2		
2	5		
3	4	3 – 5	
4	6		
5	1		
6	0	6 – 8	
7	3		
8	2		



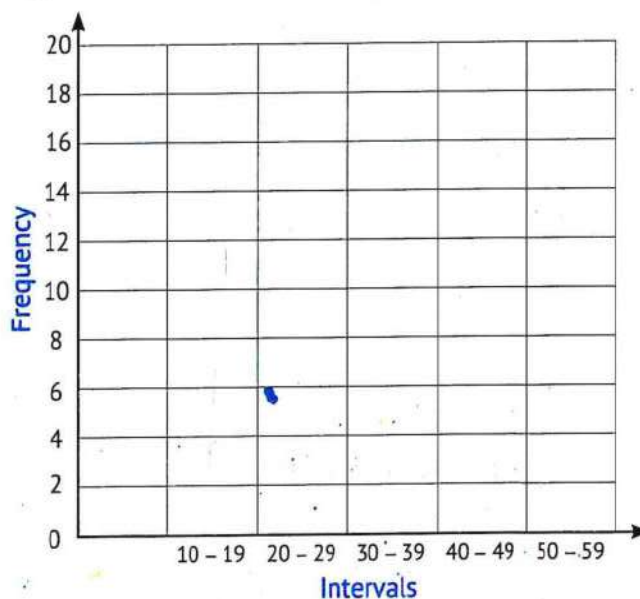
- 4 The following frequency table shows the number of stories that students read during the school year. Complete the interval table, then complete the frequency histogram drawing:

Number of Stories	Frequency	Intervals	Frequency
0	2	0 - 2	
1	3		
2	4		
3	1	3 - 5	
4	2		
5	1		
6	1	6 - 8	
7	4		
8	3		
9	1	9 - 11	
10	2		
11	1		
12	2	12 - 14	
13	1		
14	1		



- 5 Draw the histogram of the following distribution, which represents the scores of 50 students:

Interval Grades	Frequency Number of Students
10 - 19	8
20 - 29	14
30 - 39	6
40 - 49	18
50 - 59	4



6 Choose the correct answer:

- a The horizontal axis includes numerical periods in the
(dot plot or bar graph or double bar graph or histogram)
- b don't have a vertical axis.
(Dot plots or Bar graphs or Double bar graphs or Histograms)
- c may use separate columns to represent the data.
(Dot plots or Bar graphs or Double bar graphs or Histograms)
- d have horizontal axes.
(Bar graphs or Double bar graphs or Histograms or All of the previous)
- e In the dot plots,
(columns are used to represent data
or there is no need for a horizontal axis
or each information is represented by a point
or data is displayed grouped in intervals)
- f In the bar graph,
(each bar represents a number or one categorical data
or it does not need a vertical axis or the bars must touch
or each piece of information is represented by a dot)
- g In the histogram,
(it does not need a vertical axis
or the bars must touch or the data is shown above the number line
or all bars are evenly spaced)
- h In each of the bar graphs and histograms,
(bars are used to represent data or each bar represents an interval
or each bar represents one number or the data is shown above the number line)
- i In, there is a graduated scale for the vertical axis.
(dot plots only or bar graphs only
or histograms only or both of bar graphs and histograms)
- j may be used to display numerical data.
(Dot plots or Bar graphs or Histograms or All of the previous)

Assessment on Lessons 2&3

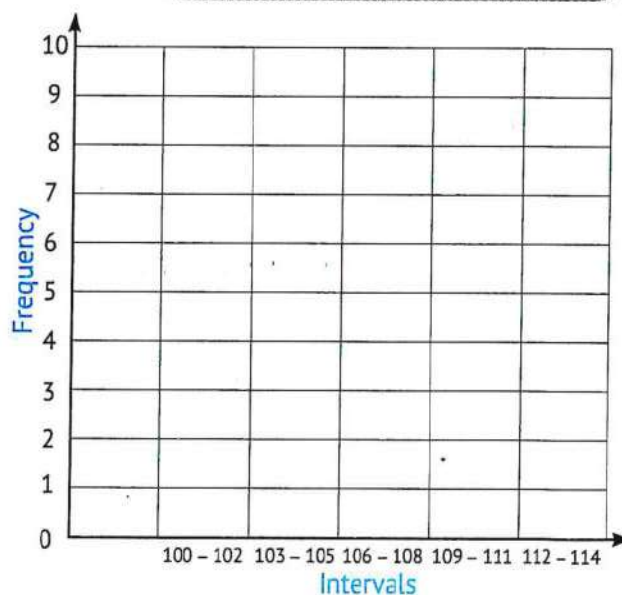
1 Choose the correct answer:

- The best graph to represent the number of pupils whose height ranges from 150 to 160 cm is a (dot plot ☐ bar graph ☐ histogram)
- The best graph to represent the number of students absent on a Sunday is a (dot plot ☐ bar graph ☐ histogram)
- has/have two axes, horizontal and vertical.
(A bar graph ☐ A double bar graph ☐ A histogram ☐ All of the previous)
- The bar graph (can display numerical and categorical data ☐ or can display only numerical data ☐ or can display only categorical data)

2 The opposite frequency table represents the lengths of a number of students in the class rounded to the nearest centimeter. Complete:

Length in Centimeters	Frequency Number of Pupils
100	2
101	3
102	1
104	2
106	3
107	4
108	1
109	5
110	2
111	1
113	2
114	5

Intervals	Frequency
100 – 102	
103 – 105	
106 – 108	
109 – 111	
112 – 114	



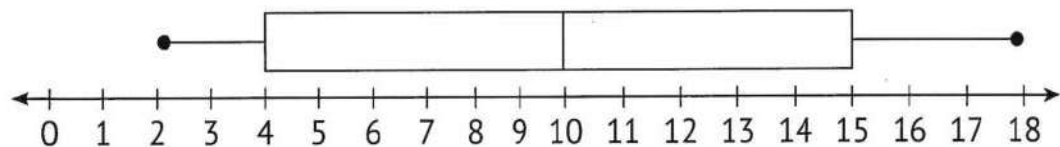
Lesson 4

1 Complete the following:

- a The median of a set of values is the element that appears in of that set.
- b The median of the set of values (5 , 7 , 8 , 3 , 6) is
- c The median of the set of values (9 , 3 , 7 , 5) is
- d The minimum value of (7 , 8 , 5 , 7 , 3) is
- e The maximum value of (6 , 3 , 2 , 4 , 1) is
- f In the values (7 , 6 , 2 , 9 , 6 , 0 , 6) , the lower quartile is , and the upper quartile is

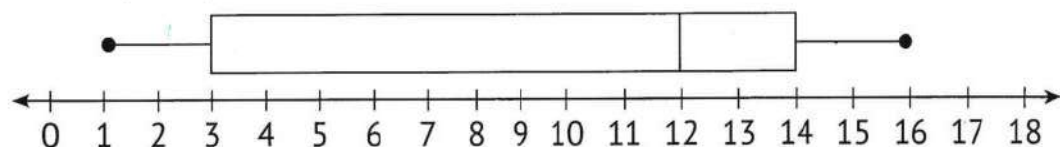
2 In each of the following, use the box plots, and select a summary of the five values:

a



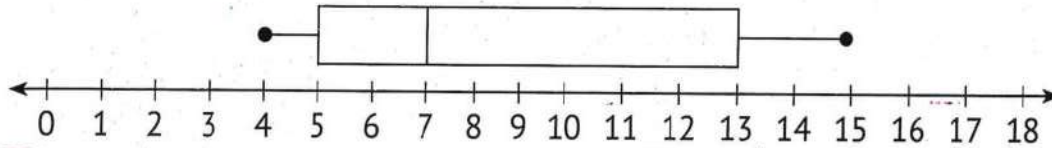
- 1 The minimum value: 2 Lower quartile:
- 3 The median: 4 Upper quartile:
- 5 The maximum value:

b



- 1 The minimum value: 2 Lower quartile :
- 3 The median: 4 Upper quartile:
- 5 The maximum value:

c



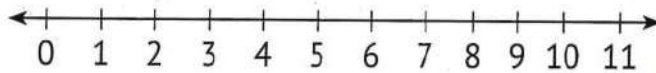
- 1 The minimum value: 2 Lower quartile:
 3 The median: 4 Upper quartile:
 5 The maximum value:

3 Draw a box plot for each of the following groups of values:

a 9, 8, 3, 1, 10

The Order:

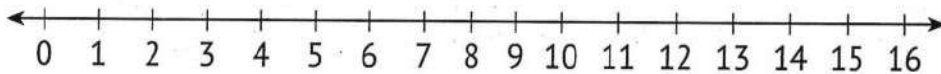
- 1 The minimum value: 2 Lower quartile:
 3 The median: 4 Upper quartile:
 5 The maximum value:



b 15, 8, 9, 2, 7, 5, 4

The Order:

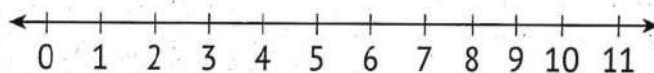
- 1 The minimum value: 2 Lower quartile:
 3 The median: 4 Upper quartile:
 5 The maximum value:



c 5, 6, 3, 7, 1, 0, 8, 8, 2, 1

The Order:

- 1 The minimum value: 2 Lower quartile:
 3 The median: 4 Upper quartile:
 5 The maximum value:

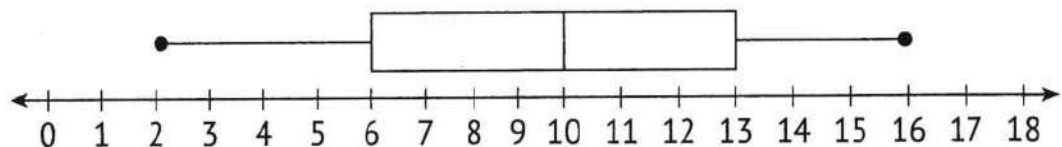


Assessment**on Lesson 4****1 Complete the following:**

- a The median of the set of values (9 , 8 , 4 , 5 , 8) is
- b The median of the set of values (3 , 4 , 2 , 12 , 8) is
- c The minimum value (7 , 2 , 6 , 1 , 9 , 8) is
- d The maximum value (4 , 7 , 1 , 8 , 6) is
- e In the set of values (5 , 3 , 1 , 9 , 8 , 6 , 7), the lower quartile is, and the upper quartile is

2 For the set of values 10 , 9 , 8 , 7 , 6 , 4 , 2 , choose the correct answer:

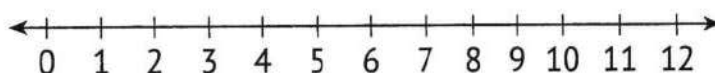
- a The minimum value: (2 or 7 or 4 or 10)
- b Lower quartile: (2 or 9 or 7 or 4)
- c The median: (4 or 7 or 9 or 10)
- d Upper quartile: (7 or 4 or 9 or 8)
- e The maximum value: (4 or 6 or 7 or 10)

3 Using the following box plot, select the 5-point summary:

- a The minimum value: b Lower quartile:
- c The median: d Upper quartile:
- e The maximum value:

4 Draw a box plot for the values (5 , 2 , 9 , 4 , 3 , 6 , 2):

- a The minimum value: b Lower quartile:
- c The median: d Upper quartile:
- e The maximum value:

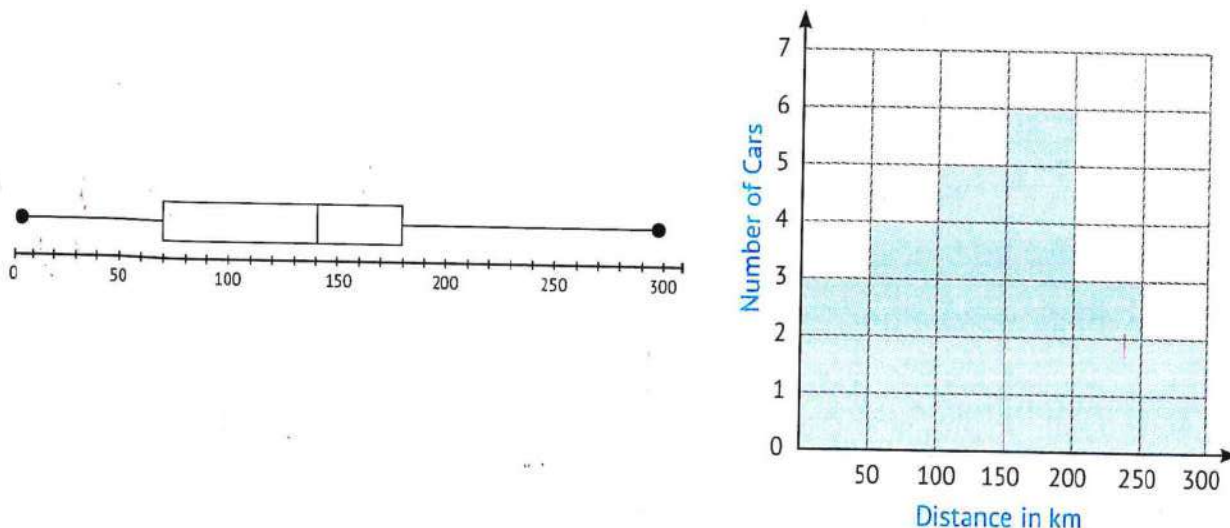


Lesson 5

- 1 Identify the graph that can be used to answer the following statistical questions:

Question: What is/are ...	Graph		
	Dot Plot	Histogram	Box Plot
a the maximum value?			
b the minimum value?			
c the median?			
d the upper quartile?			
e the lower quartile?			
f the total number of values?			
g the number of times a specified value is repeated?			
h the most frequent value?			
i the least frequent value?			
j the number of repetitions of values in a specified interval?			
k the number of repeated values for a set of intervals?			
l the number of values less than a specified value?			
m the number of values greater than a specified value?			
n the gaps?			

- 2 Ahmed owns a showroom for used cars. Ahmed checked the odometers of these cars and recorded the kilometres traveled by each car. He represented these results using the histogram and the box plot as shown:



- a Answer the following, explaining the best graph that helped you in the answer:

	Question	Answer	Graph	
			Histogram	Box Plot
1	How many cars have driven more than 200 km?			
2	What is the median value?			
3	What is the minimum distance traveled by a car?			
4	What is the greatest distance traveled by a car?			
5	How many cars drove from 50 km to 100 km?			

- b Write two questions that can be answered using:

1 A histogram

.....

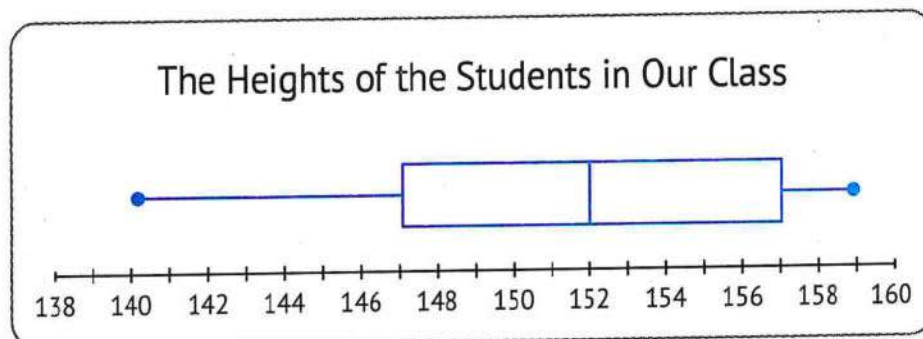
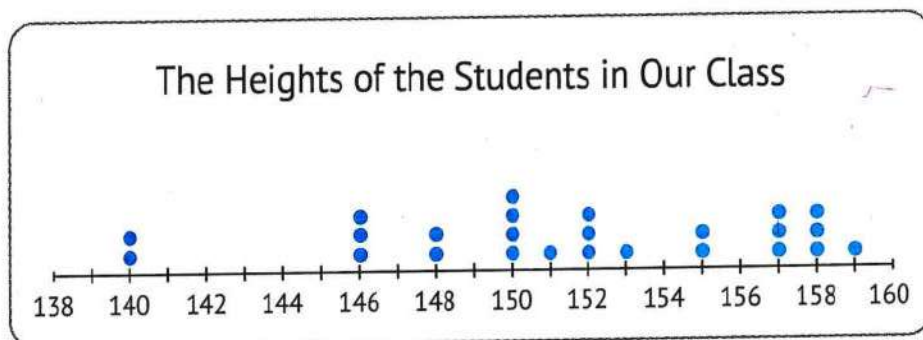
.....

2 A box plot

.....

.....

- 3 The dot plot and the following box plot show the heights of a number of pupils in your class:



- a Answer the following, explaining the graph that helped you in your answer.

Question	Answer	Graph	
		Dot plot	Box Plot
1 How many students are 150 cm tall?			
2 What is the median value?			
3 What is the height of the shortest student?			
4 How tall is the tallest student?			
5 How many students are less than 149 cm tall?			

- b Write two questions that can be answered using both graphs:

- 4 The following table shows data on the amount of time that sixth graders spend listening to music each week.

Number of Minutes Students Spent Listening to Music per Week									
120	15	45	30	60	90	0	125	30	240
75	45	80	10	20	35	45	90	100	115
75	40	70	100	120	120	150	15	0	20
5	120	45	80	10	45	50	100	15	0
20	35	120	150	30	60	90	20	35	40

What is the most appropriate graph if you want to determine the number of minutes students typically spend listening to music?

(_____)

- 5 Match each of the following with the appropriate graph:

a Representation of individual values •

• Histogram 1

b Representation of hundreds of notes •

• Dot plot 2

c Representation of data peaks and gaps in the data •

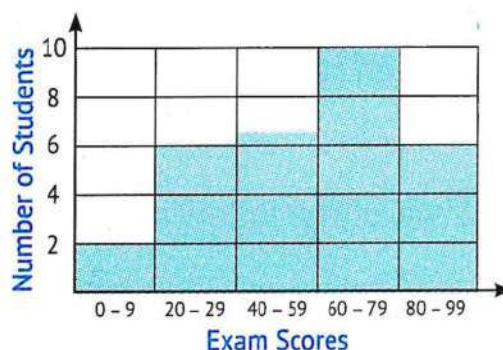
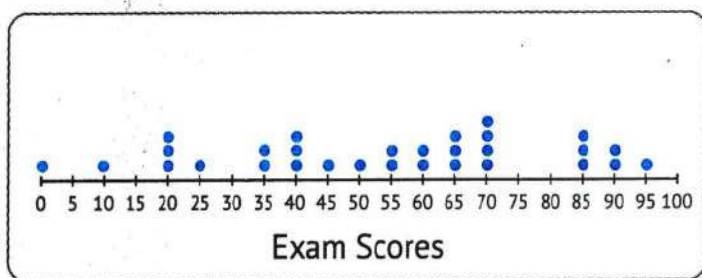
• Box plot 3

Assessment on Lesson 5

1 Match each question with the appropriate drawing or drawings:

- | | | | | |
|---|---|---|-----------|---|
| a | How many times is a specified value repeated? | • | Histogram | 1 |
| b | What is the median value? | • | Dot plot | 2 |
| c | How many times is the value repeated in a given period? | • | Box plot | 3 |

2 The dot plot and histogram below show the exam scores for a number of students in your class:



Answer the following, explaining the graph that helped you in the answer:

- What is the highest grade obtained by the students?
(Answer:) (Graph:)
- What is the lowest score obtained by the students?
(Answer:) (Graph:)
- How many students did you draw on the graph?
(Answer:) (Graph:)
- How many students got less than 40 marks?
(Answer:) (Graph:)
- How many students got 80 degrees or more?
(Answer:) (Graph:)



Assessment on Unit 6

First: Choose the correct answer:

- 1 Statistical questions
(result in a lot of different answers ☐ or have one answer ☐
☐ have a yes or no answer ☐ have a one number answer)
- 2 From the categorical data are
(birthdates ☐ ages ☐ weights ☐ favorite colors)
- 3 From the numerical data
(preferred colors ☐ blood types ☐ places of birth ☐ ages)
- 4 All of the following data are categorical, except for
(favorite foods ☐ jobs ☐ weights ☐ eye colors)
- 5 All of the following data are numerical, except
(temperatures ☐ lengths ☐ names ☐ weights)
- 6 The horizontal axis includes numerical periods in a
(dot plot ☐ bar graph ☐ double bar graph ☐ histogram)
- 7 A does not have a vertical axis.
(dot plot ☐ bar graph ☐ double bar graph ☐ histogram)
- 8 In, there is a graduated scale for the vertical axis.
(dot plots only ☐ bar graphs only ☐
☐ both bar graphs and histograms ☐ histograms only)
- 9 The maximum value of the values 8 , 6 , 8 , 7 , 2 , 6 , 3 is
(2 ☐ 7 ☐ 8 ☐ 6)
- 10 The upper quartile of the values 9 , 3 , 0 , 4 , 8 , 1 , 7 is
(9 ☐ 4 ☐ 1 ☐ 8)

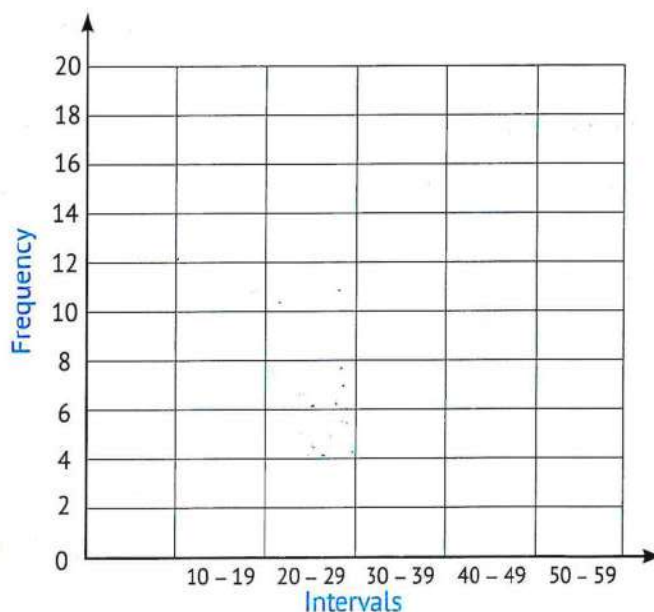
Second: Complete the following:

- 1 The types of questions are questions and questions.
- 2 The types of statistical data are data and data.
- 3 The monthly income of an institution's employees is from the data.
- 4 The number of letters of the first name of each student in the class is from the data
- 5 The best graph to represent the number of pupils between the ages of 12 and 15 years is
- 6 The best graph to represent the number of studying hours for a student on Saturday is
- 7 The median of the values "9 , 2 , 8 , 6" is
- 8 The minimum value of the values "2 , 9 , 1 , 1 , 8 , 5" is
- 9 The most appropriate graph to represent individual data and the number of data values present is
- 10 The most appropriate graph to represent peaks and gaps and aggregate data is

Third: Answer the following:

- 1 Draw the histogram of the following data, which represent the scores of 50 students.

Interval Grades	Frequency Number of Students
10 – 19	4
20 – 29	12
30 – 39	18
40 – 49	9
50 – 59	8



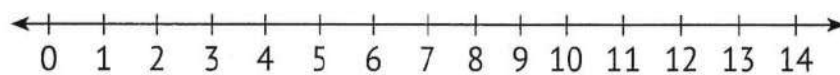
2 Draw the box plot for the following values and complete:

(3, 8, 7, 2, 10, 12, 9, 2, 10, 9).

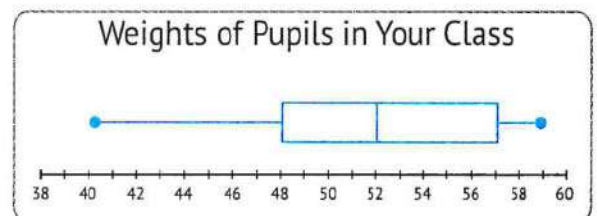
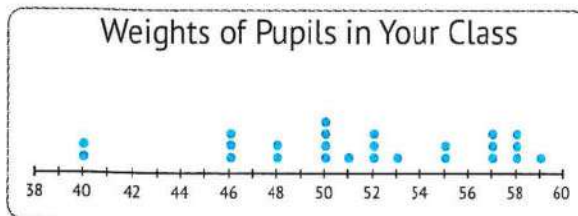
The order:

Minimum Value: Maximum Value: Median:

Upper Quartile: Lower Quartile:



3 The dot plot and the box plot below show the weights of a number of pupils in your class.



a Answer the following, explaining the graph(s) that helps you in the answer.

Question	Answer	Graph	
		Dot plot	Box Plot
1 How many students weigh 57 kg?			
2 What is the median value?			
3 What is the weight of the lightest pupil?			
4 What is the weight of the heaviest pupil?			
5 How many students weigh more than 54 cm?			

b Write two questions that can be answered using:

A dot plot

1 2

A box plot

1 2

ACCUMULATIVE ASSESSMENT

on Units 1-6

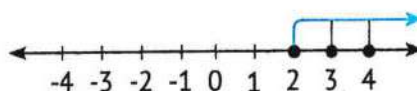


First: Choose the correct answer:

- 1 The GCF of relatively prime numbers is
(0 or 1 or their sum or their product)
- 2 is neither a positive nor a negative number. (0 or 1 or -1 or 10)
- 3 The set of integers is a subset of the set of numbers.
(counting or natural or even or rational)
- 4 The number of terms that make up the algebraic expression
"5 x + 3 y + 2" is (2 or 3 or 5 or 6)
- 5 The inequality that represents all values less than or equal to -7 is
($x > -7$ or $x < -7$ or $x \leq -7$ or $x \geq -7$)

Second: Complete the following:

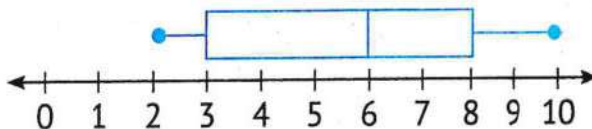
- 1 to the power = 6^4
- 2 If a meal costs 65 pounds, what is the price of " b " meals of the same type
=
- 3 If $8m = 16$, then $2m + 3 =$
- 4 The inequality that represents positive integers is
- 5 The inequality represented on opposite
number line is



Third: Answer the following:

- 1 Use the opposite box plot to find:

- a Minimum Value:
- b Maximum Value:
- c Upper Quartile:



- c Median:
- e Lower Quartile:

- 2 Find the value of each of the following:

a $d^3 + 7$ for , [$d = 3$]

=

b $37 - 4e$ for , [$e = 2$]

=

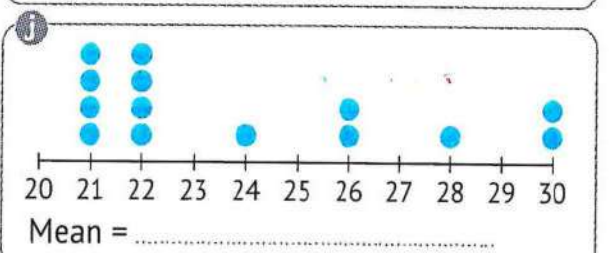
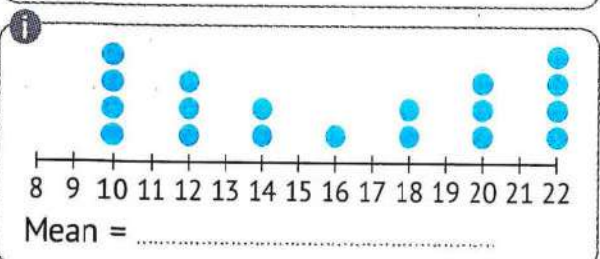
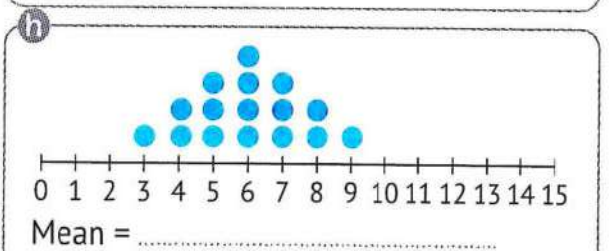
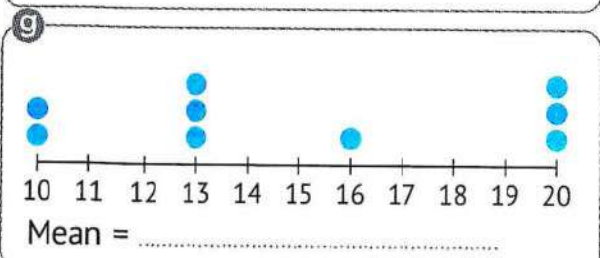
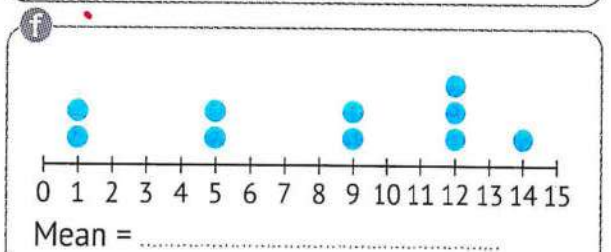
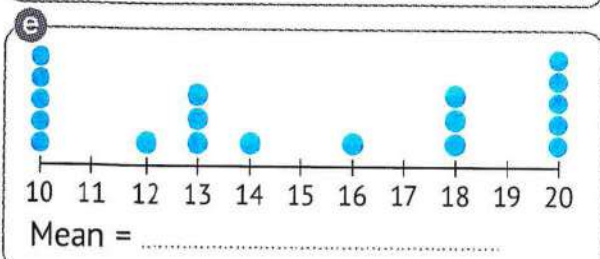
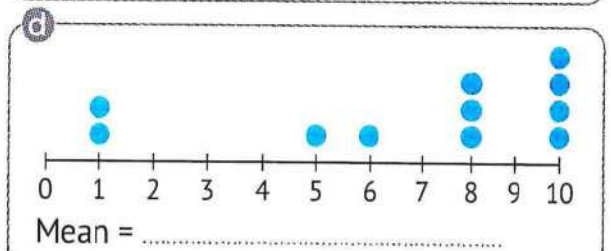
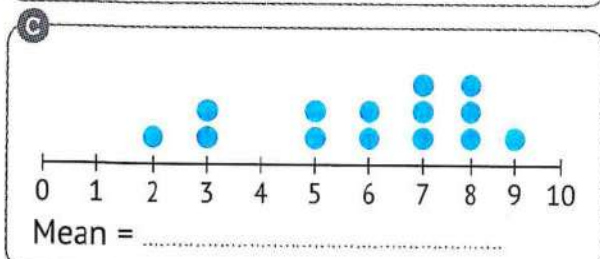
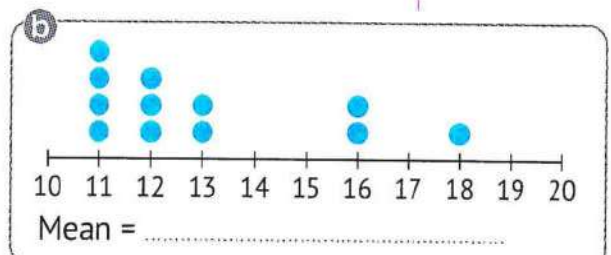
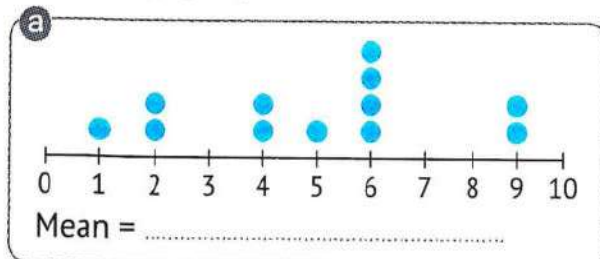
Unit 7 Measures of Central Tendency and Spread

Concept 7.1

Exploring Measures of Central Tendency and Spread

Lessons 1&2

- 1 Determine the **mean** (the center of the data set) for each of the following graphs:



2 Find the **mean** for each of the following groups of values:

	Values	Mean
a	4 , 6	.....
b	3 , 8	.....
c	2 , 4 , 6	.....
d	1 , 3 , 5	.....
e	1 , 2 , 3 , 4 , 5	.....
f	35 , 50 , 60 , 55	.....

3 If the heights of five pupils in the first preparatory grade in centimeters are: **124** , **130** , **122** , **126** , and **128**.

Calculate the **mean** for these lengths.

.....

.....

4 If Sheriff's grades in **3** consecutive months in Mathematics are **88** , **91** , and **97** , then calculate his **mean** of grades.

.....

.....

5 If the temperatures for a full week of December in one of the cities are: **25°** , **27°** , **31°** , **23°** , **22°** , **18°** , and **22°** , then calculate the **mean** of these degrees.

.....

.....

- 6 If the numbers of goals scored by Al-Ahly in 6 matches are 4 , 2 , 3 , 1 , 0 , and 2 , then calculate the mean for the numbers of goals

- 7 The following table represents the number of study hours for a student during 6 consecutive days:

Day	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday
Number of Hours	$3\frac{1}{2}$	3	$2\frac{1}{2}$	3	4	2

Calculate the mean of study hours per day.

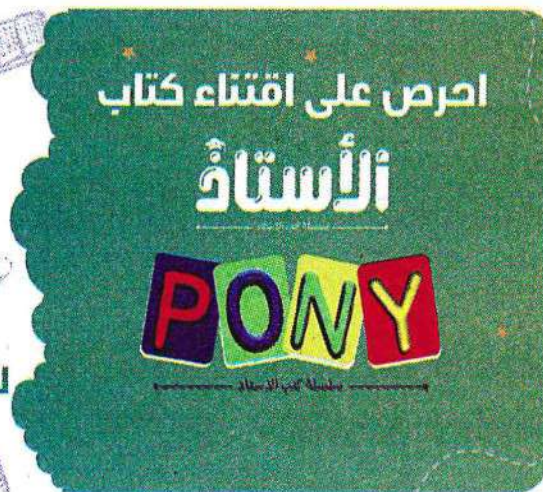
- 8 Complete the following:

- The mean of the values (18 , 35 , 34 , 6) is _____ .
- The mean of the values (6 , 3 , 1 , 7 , 6 , 2 , 1 , 6) is _____ .
- If the mean of the values (3 , 4 , 6 , x , 7) is 6 , then the value of x is _____ .
- If the mean of the values (2 , 7 , 2 , x) is 3 , then the value of x is _____ .
- If the sum of 7 values equals 56 , then the mean of these values is _____ .
- If the sum of a set of values is 45 , and the mean of these values is 5, then the number of these values is _____ .
- If the mean of a set of values is 8 and the number of these values is 6, then the sum of these values is _____ .

9 Choose the correct answer:

- a The mean of the values (6 , 7 , 8 , 4 , 10) is
(35 or 7 or 10 or 4)
- b The mean of the values (4 , 9 , 7 , 1 , 1 , 2) is
(4 or 2 or 3 or 24)
- c If the mean of a set of values is 3 and the number of these values is 8,
then the sum of the values is equal to
(11 or 24 or 5 or 8)
- d If the mean of a set of values is 9 and the sum of these values
is 45 , then the number of these values is
(5 or 45 or 50 or 9)
- e If the mean of the scores of five students is 20 , then the sum
of their scores is a degree
(4 or 15 or 25 or 100)
- f If the mean of Manal and Siham's ages is 7 years, and Manal's age is 8
years, then Siham's age is years.
(6 or 7 or 8 or 15)

في
ICT
للف السادس الابتدائي

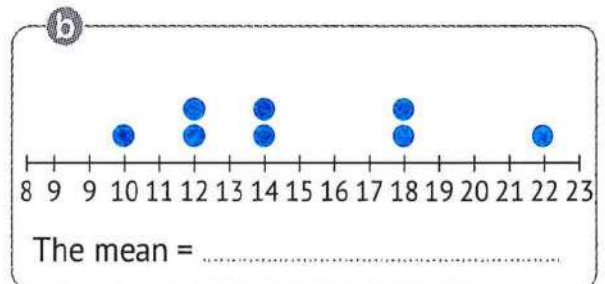
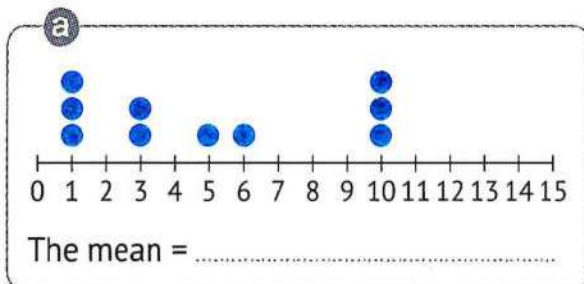


Assessment on Lessons 1&2

1 Complete the following:

- The mean of the values (8 , 3 , 13) is
- The median of the values (8 , 3 , 4 , 2) is
- If the sum of a group of values is 18 , and the mean of these values is 3 , then the number of these values is
- If the mean of 5 values is 15, then the sum of these values is
- If the mean of the values: 8 , 3 , 5 , x , and 2 is 7 , then the value of x is

2 Determine the mean (the center of the data set) for each of the following graphs:



3 If the number of working hours for a worker in a factory is 5 consecutive days, as follows:

Day	Sunday	Monday	Tuesday	Wednesday	Thursday
Number of Working Hours	$6\frac{1}{2}$	7	8	$4\frac{1}{2}$	6

Calculate the mean of working hours per day.

.....

4 If the sales of a commercial store are in pounds for a period of 4 days, they are: 60,050 , 36,450 , 42,000 , 25,500 Calculate the mean of sales for the store.

.....

Lesson 3

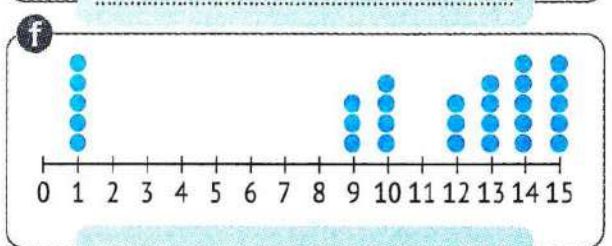
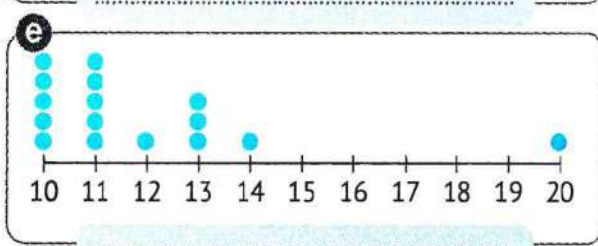
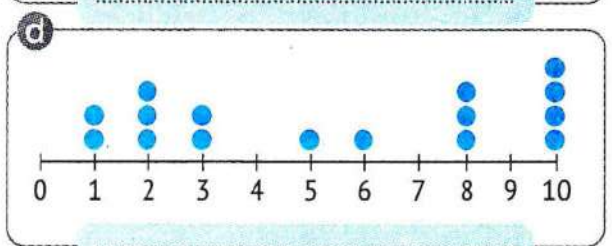
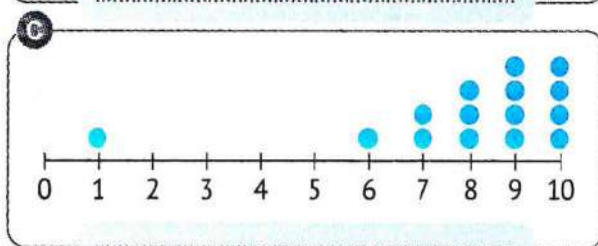
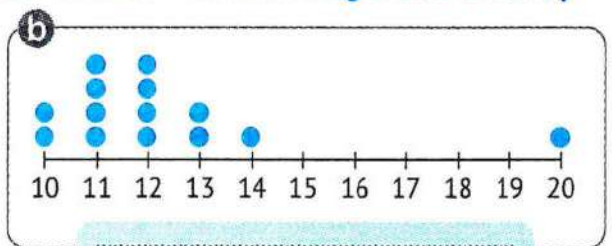
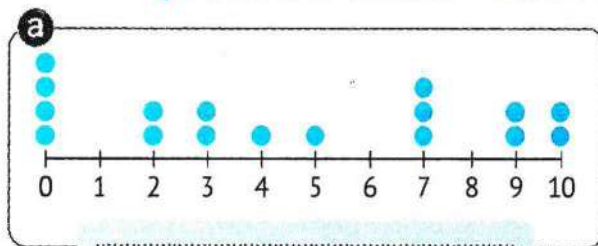
1 Find the **mode** for each of the following sets of values:

	Values	Mode
a	6, 7, 8, 6, 5	
b	9, 5, 5, 9, 7, 3	
c	4, 9, 1, 0, 8	
d	9, 3, 2, 9, 3, 9, 7	
e	12, 18, 19, 22, 12, 12	
f	10, 19, 17, 16, 15	
g	1, 2, 8, 9, 1, 3, 1	
h	3, 0, 8, 2, 9, 30	
i	3, 3, 5, 3, 6, 6, 6	
j	4, 14, 24, 42, 41, 44	

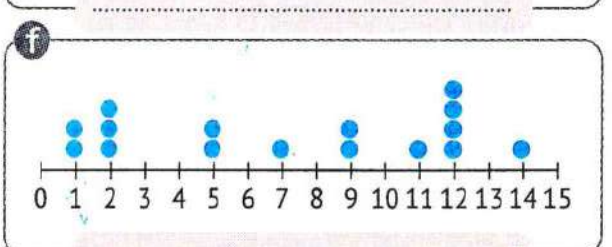
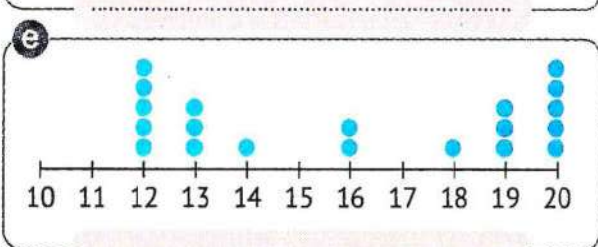
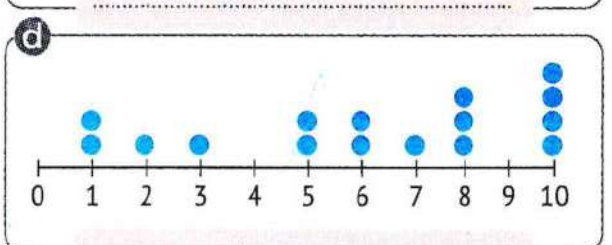
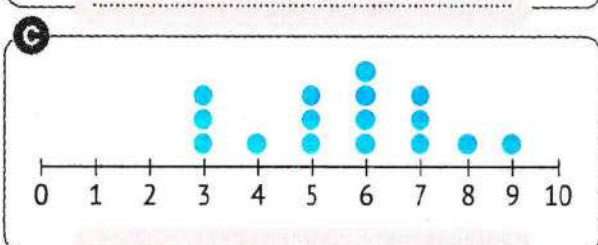
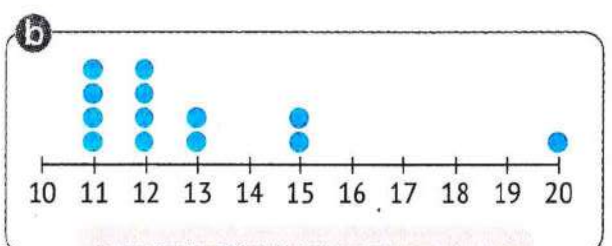
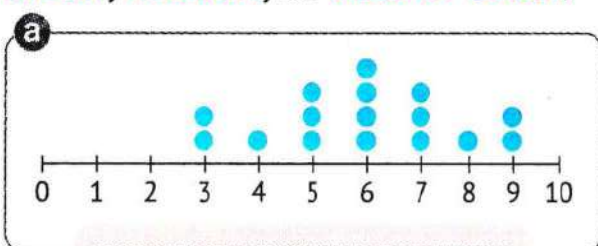
2 List the **outliers** in each of the following values:

	Values	Outliers
a	6, 8, 28, 7, 5	
b	25, 30, 27, 2, 29	
c	24, 24, 200, 25, 26	
d	45, 52, 63, 4, 59	
e	25, 24, 25, 26, 24, 26	
f	142, 125, 130, 135	
g	11, 9, 10, 50, 12, 9, 51	
h	63, 75, 219, 56, 72, 220	
i	0, 3, 6, 7, 5, 1, 6	
j	100, 150, 50, 200, 100, 150	

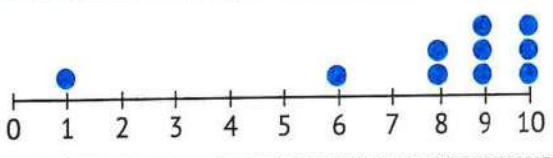
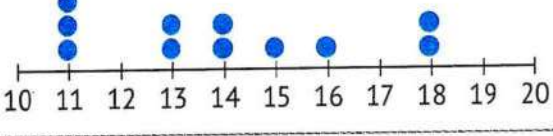
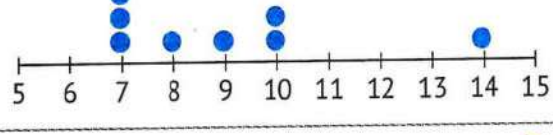
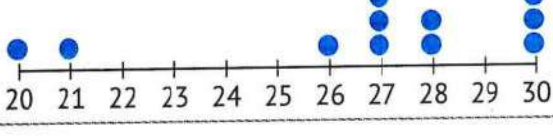
- 3 Choose the correct description that applies to each graph below.
(Mean increases - Mean decreases - Mean stays the same)



- 4 For each of the following data representation charts, choose the measure of central tendency that you think would be best used, mean, median, or both of them.



- 5 Complete the following table using the dot plot graph for each of the following:

	Graph	Mean	Median	Mode	Outliers
a					
b					
c					
d					

- 6 Complete the following:

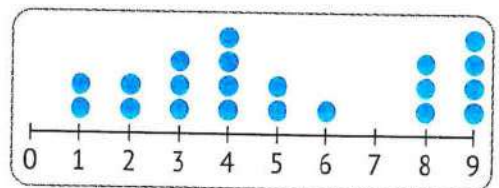
- The mode of a set of data is in that set.
- The mode of the values (9 , 2 , 6 , 7 , 2 , 8) is
- The outlier in the set of values (9 , 8 , 7 , 25 , 6) is
- The mean increases if the outliers are than the other values.
- The mean is if the outliers are less than the other values.
- The mean is by the outliers in the data set.
- The median is by the outliers in the data set.
- If the graph is skewed to one side, then will be the best choice as a measure of the center.
- If the graph is evenly distributed, then will be the best choice as a measure of the center.

Assessment

on Lesson 3

1 Complete the following:

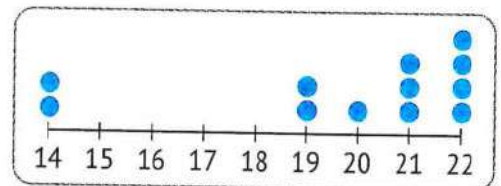
- The mode of the values (3 , 25 , 15 , 5 , 3) is
- The mode of the values (pen, ruler, eraser, pen, ruler, pen) is
- If the mode of the set of values (6 , 2 , 4 , x , 3) is 6 , then x =
- is affected by the outliers in the data set.
- will be the best choice as a measure of the center in the opposite graph (mean or median).



2 Choose the correct answer:

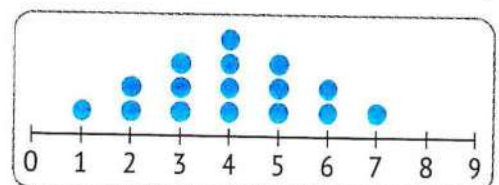
- The values (5 , 3 , 2 , 5 , 2 , 7) have
(no mode ☐ or one mode ☐ or two modes ☐ or three modes ☐)

- The correct description that applies to the opposite graph is that the mean



(increases ☐ or decreases ☐ or remains the same ☐)

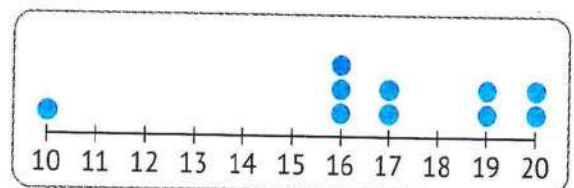
- will be the best choice as a measure of the center in the opposite graph.



(The mean ☐ The median ☐ The mode ☐ Both mean and median ☐)

3 Answer using the following graph:

- Mean:
- Median:
- Mode:
- Outliers:

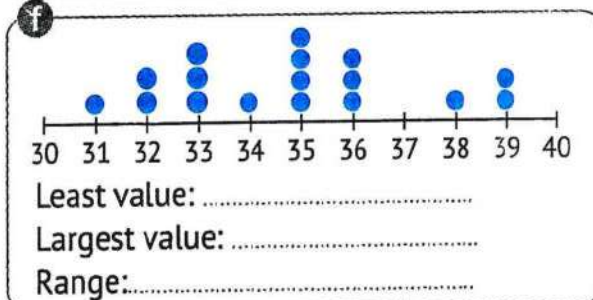
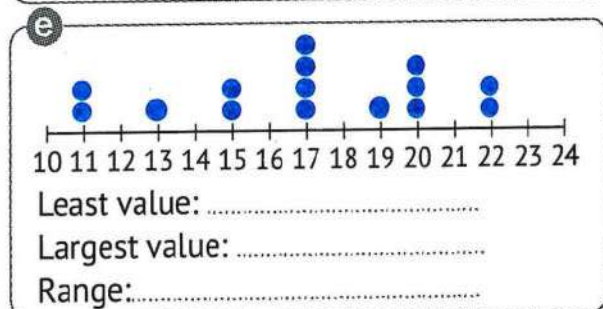
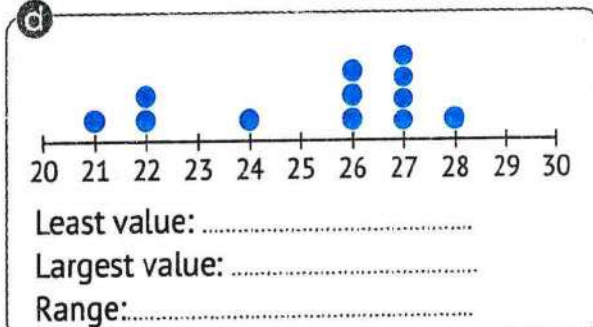
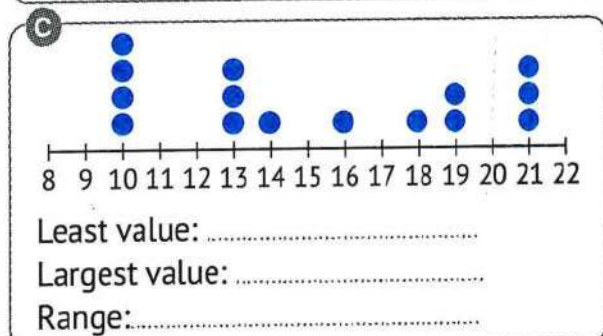
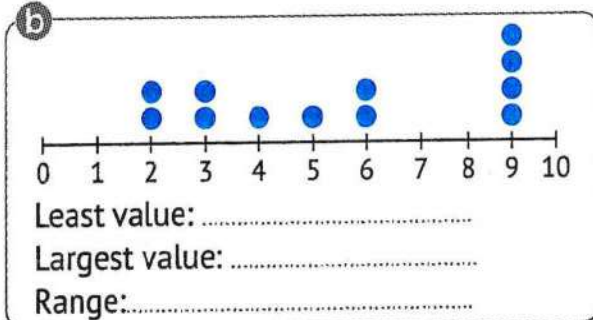
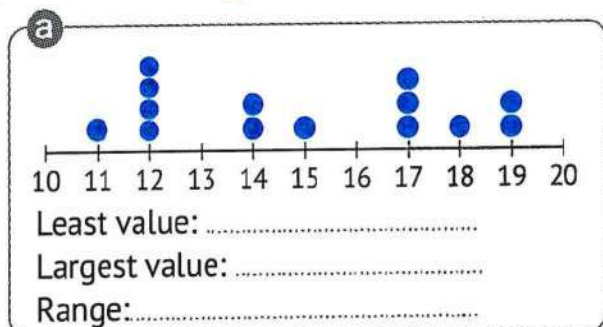


Lesson 4

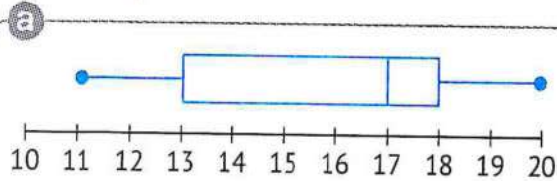
1 Find the **range** for each of the following sets of values:

	Values	Range
a	45, 25, 13, 30, 35	.....
b	11, 45, 17, 25, 13	.....
c	6, 2, 7, 7, 5, 3	.....
d	9, 2, 7, 6, 3, 4, 9	.....
e	15, 36, 70, 25, 12	.....
f	7, 9, 2, 7, 2, 7, 2, 5	.....
g	66, 25, 66, 15, 66	.....

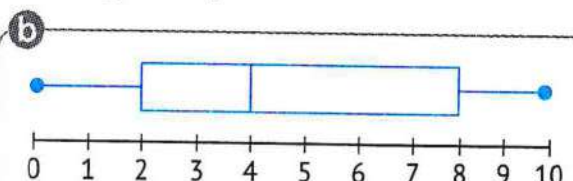
2 Find the **range** using each of the following dot plot graphs:



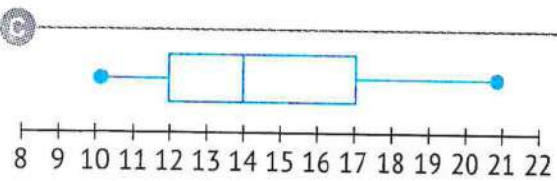
3 Find the range using each of the following box plots:



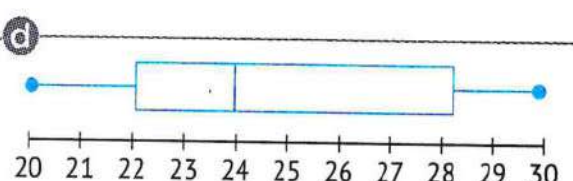
Largest value:
 Least value:
 The range =



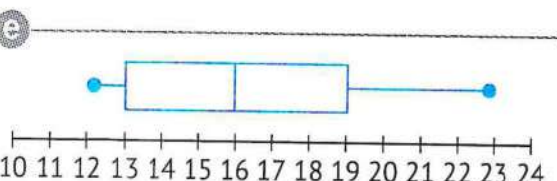
Largest value:
 Least value:
 The range =



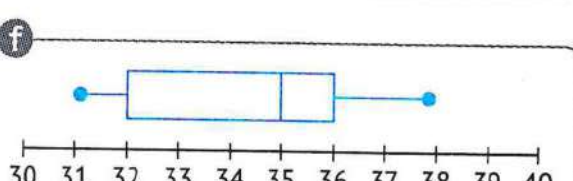
Largest value:
 Least value:
 The range =



Largest value:
 Least value:
 The range =



Largest value:
 Least value:
 The range =



Largest value:
 Least value:
 The range =

Find the **range** in each of the following:

The following table shows the ages of a group of friends:

Name	Majed	Tawfiq	Rami	Malik	Mahmoud
Ages	15	11	18	13	14

Largest value: Least value: Range:

- b** The following table shows the amounts saved by Lamia over the past 5 months:

Month	First	Second	Third	Fourth	Fifth
The amount in pounds	120	135	200	85	115

Largest value: Least value: Range:

- c** The following table shows the number of visitors to an exhibition for 5 days:

Day	Sunday	Monday	Tuesday	Wednesday	Thursday
Number of visitors	1,200	2,000	3,400	3,000	3,600

Least value: Largest value: Range:

- d** The following table shows the number of students in each class in a school:

Class	First	Second	Third	Fourth	Fifth	Sixth
Number of students	280	275	250	260	224	215

Least value: Largest value: Range:

5 Complete the following

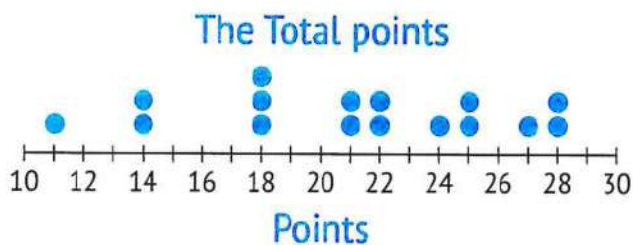
- Range = -
- It is easier to find the range using a or
- The range cannot be found using
- The range for the values "9 , 2 , 4 , 1 , 8 , 5" is
- If the largest value is 15, and the least value is 3, then the range =
- If the range of a set of values is 12 and the smallest value is 5, then the largest value is
- If the range of a set of values is 25 and the largest value is 52, then the smallest value is
- Range is by outliers in the data set (affected, unaffected).
- It is easier to find the range using a dot plot or box plot because each of them explains
- The range is a measure of

Assessment**on Lesson 4****1 Complete the following:**

- a is the difference between the highest value and the lowest value.
- b The range for the values "3 , 7 , 9 , 5 , 8 , 7" is
- c If the range of a set of values is 15 and the largest value is 36, then the smallest value is
- d It is easier to find the range using a dot plot or box plot.
because each of them explains and

2 Choose the correct answer:

- a If the largest value is 18 and the least value is 6, then the range is
(12 or 24 or 3 or 78)
- b If the range of a set of values is 11 and the smallest value is 7,
then the largest value is (4 or 18 or 77 or 70)
- c All of the following are measures of the central tendency, except
(mean or median or mode or range)
- d The range cannot be found using the
(dot plot or box plot or histogram or bar chart)

3 The following dot plot shows the total points Jalal scored in each basketball game this season, complete:

- a Least value:
- b Largest value:
- c Range:
- d The mean:
- e The median:
- f The mode:



Assessment on Unit 7

First: Choose the correct answer:

1 If the mean of a set of values is 7 and the number of these values is 9, then the sum of the values is (16 or 63 or 2 or 9)

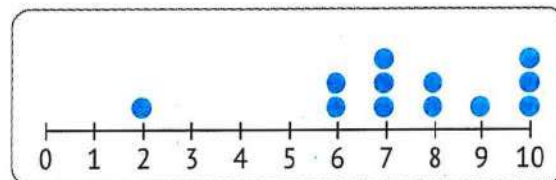
2 If the mean of a set of values is 8 and the sum of these values is 48, then the number of these values is equal to (6 or 40 or 56 or 8)

3 is not affected by outliers in the data set.
(The mean or The mode or The median or All of them)

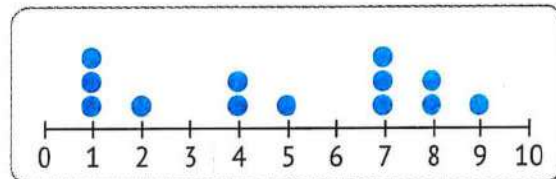
4 The range cannot be found using
(the dot plot or the histogram or the box chart or all of them)

5 is one of the measures of spread.
(The mean or The median or The mode or The range)

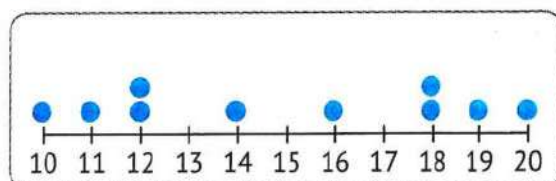
6 The correct description that applies to the opposite graph is that the mean
(increases or decreases or remains the same or The range)



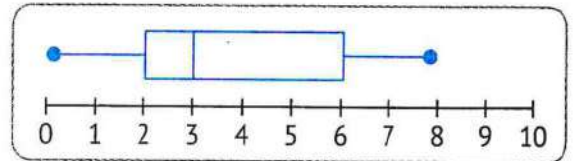
7 The best choice as a measure of central tendency for the values represented in the opposite graph is
(the mean or the median or the mode or both the mean and the median)



8 The mean of the values represented by the opposite dot plot graph is
(15 or 20 or 14 or 16)

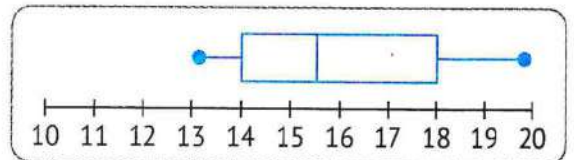


- 9 The median of the values represented by the opposite box plot graph is



(2 or 3 or 6 or 8)

- 10 The range of values represented on the opposite box plot is

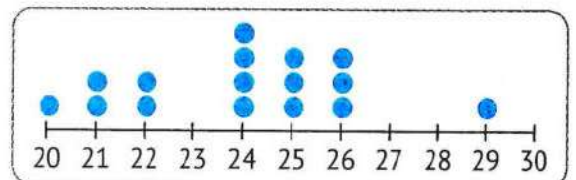


(4 or 18 or 5 or 7)

Second: Answer the following:

- 1 The mean of the values: 9 , 7 , 3 , 1 , 8 , 2 is
- 2 The mode of the values 5 , 3 , 8 , 7 , 3 , 5 is
- 3 The range for the values: 15 , 5 , 17 , 3 , 12 is
- 4 The outliers in the set of values: 5 , 18 , 3 , 4 , 7 , 6 are
- 5 and are affected by the presence of outliers.
- 6 Answer using the corresponding graph.

- a The mean:
- b The median:
- c The mode:
- d The range:
- e Outliers:



- 7 The following table represents the temperatures recorded in a city in a week:

Day	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Temperature	26°	25°	30°	25°	23°	24°	22°

Using the values shown table, find:

- a The mean:
- b The median:
- c The mode:
- d The range:
- e Outliers:

ACCUMULATIVE ASSESSMENT

on Units 1-7

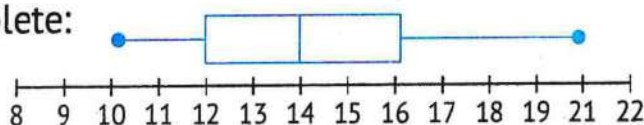


First: Choose the correct answer:

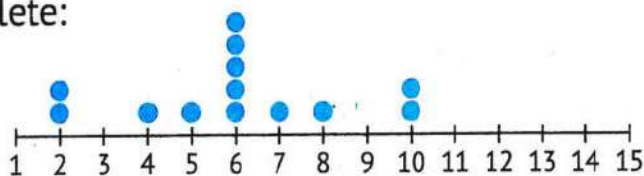
- 1 The GCF of 9 and 8 is (9 or 8 or 1 or 72)
- 2 $1\frac{3}{4} + 2\frac{1}{2} =$ ($4\frac{1}{4}$ or $3\frac{1}{4}$ or $3\frac{4}{6}$ or 4)
- 3 The rational number $-2\frac{3}{4}$ is between the two whole numbers
(-1 , -2 or -2 , -3 or 1 , 2 or 2 , 3)
- 4 Twice the sum of 7 and x is
($2x + 7$ or $2(x + 7)$ or $27 + x$ or $2(2x + 7)$)
- 5 may use separate columns to represent the data.
(Dot plots or Bar graphs or Double bar graphs or Histograms)
- 6 The smallest two-digit prime number is (2 or 3 or 11 or 12)
- 7 The additive inverse of 5.9 is (5.9 or 9.5 or -5.9 or -9.5)
- 8 The variable in the term " $2.5x$ " is (2.5 or x or $2.5x$ or xy)

Second: Answer the following:

- 1 The inequality that represents all values "greater than -1" is
- 2 $z + 5 = m$: independent variable is, dependent variable is
- 3 Use the following box plot to complete:



- a Maximum value:
- b Minimum value:
- c Median: d Range:
- 4 Use the following dot plot to complete:



- a Maximum value:
- b Minimum value:
- c Median:
- d Mean: e Range:

Guide Answers

Exercises Book

Theme 1

Exercises on

Unit 1

Lesson 1

- 1 a 9, 0, divisible b 6, 1, not divisible
c 8, 4, not divisible d 13, 0, divisible
e 8, 3, not divisible f 9, 0, divisible
g 4, 0, divisible h 4, 3, not divisible
i 30, 0, divisible j 30, 4, not divisible
k 49, 0, divisible l 150, 1, not divisible
m 25, 2, not divisible n 104, 0, divisible
- 2 30 - 54 - 26 - 258 - 216 - 250 - 368 - 654 - 2,544
- 3 45 - 36 - 456 - 558 - 777 - 891 - 4,662
- 4 32 - 612 - 440 - 2,100 - 3,636 - 32,100 - 40,056 - 30,008
- 5 45 - 250 - 830 - 940 - 630 - 2,005 - 12,745 - 1,200
- 6 a 532 - 650 - 762 - 900
b 711 - 345 - 762 - 900 c 532 - 900
d 335 - 650 - 345 - 900 e 762 - 900
f 650 - 900
- 7 a X, ✓, X, ✓, X, X
b ✓, X, ✓, X, X, X
c ✓, ✓, X, ✓, ✓, ✓
d ✓, X, X, ✓, X, ✓
e ✓, ✓, ✓, ✓, ✓, ✓
f ✓, ✓, X, X, ✓, X
g ✓, ✓, X, ✓, ✓, ✓

h X, ✓, X, ✓, X, X

i ✓, X, ✓, ✓, X, ✓

j ✓, X, ✓, X, X, X

8 a 0 b not divisible c 2

d 0, 2, 4, 6 or 8 e 3

f not a multiple g 4 h 5

i 12, 3 j 24, 4

k 28, 7, 7, 28

9 a 2 b 213 c 2, 5 and 10

d 12 e 10 f 12

g multiple h 1

Assessment on Lesson

1

1 a 5 b 3 c divisible

d 18 e 2 f even

g 10

2 a 816 - 720 b 816 - 720 - 1,239

c 816 - 720 d 720 - 4,955

e 816 - 720 f 720

Lesson 2

- 1 a GCF = 2, LCM = 24
b GCF = 6, LCM = 72
c GCF = 1, LCM = 36
- 2 a prime factors $6 = 2 \times 3$, $4 = 2 \times 2$
GCF = 2, LCM = 12, (NO)
b prime factors $15 = 3 \times 5$, $6 = 2 \times 3$
GCF = 3, LCM = 30, (NO)
c prime factors $8 = 2 \times 2 \times 2$, $9 = 3 \times 3$
GCF = 1, LCM = 72, (Yes)
d prime factors $12 = 2 \times 2 \times 3$, $14 = 2 \times 7$
GCF = 2, LCM = 84, (NO)
e prime factors $18 = 2 \times 3 \times 3$, $9 = 3 \times 3$
GCF = 9, LCM = 18, (NO)
f prime factors $6 = 2 \times 3$, $25 = 5 \times 5$
GCF = 1, LCM = 150, (Yes)

- 3 a ① 30 and 42 ② 3, 2
 ③ 6 ④ 210 ⑤ (No)
 b ① 24 and 16 ② 2, 2, 2
 ③ 8 ④ 48 ⑤ (No)
 c ① 20 and 9 ② 1
 ③ 1 ④ 180 ⑤ (Yes)
 4 a 2 b 2 c 2
 d 3 e prime number
 f 11 g 2, 3, 5, 7
 h 3, 7 i 18 j 1
 k their product
 5 a 1 b 59 c 30
 d has only two factors e prime
 f $2 \times 2 \times 3$ g 8 h 1
 i 1 j their product
 k their product l 1 m 35
 n 72 o 1

Assessment on Lesson 2

- 1 a 42 b 1
 c 0 d 1 e their product
 f 1 g 9 h 9 and 4
 2 • $16 = 2 \times 2 \times 2 \times 2$
 $12 = 2 \times 2 \times 3$ • GCF = $2 \times 2 = 4$
 • LCM = $2 \times 2 \times 2 \times 2 \times 3 = 48$

Lesson 3

- 1 a 7, 5, 7, 2 b 8, 2, 8, 9
 c 8, 5, 3 d 3, 3, 7 e 2, 4, 5, 5
 f 8, 7, 6, 6 g 7, 5, 1 h 2, 4, 3
 2 a GCF = 9 b $18 \div 9 = 2$ kg of oranges
 c $27 \div 9 = 3$ kg of apples
 3 a GCF = 4 → 4 groups
 b 3 doctors c 7 nurses
 4 • GCF = 12 → 12 groups
 • $(12 \times 6) + (12 \times 3) = 12 \times (2 + 3)$
 5 • GCF = 6 → 6 bags
 • $(6 \times 1) + (6 \times 2) = 6 \times (1 + 2)$

Assessment on Lesson 3

- 1 a $(4 \times 2) + (4 \times 9)$ b $6 \times (3 + 2)$
 c 7 d 6 e 0
 2 a $4 \times (4 + 3)$ b $3 \times (3 + 7)$
 3 • GCF = 7 → 7 groups
 • $(7 \times 3) + (7 \times 5) = 7 \times (3 + 5)$

Lesson 4

- 1 a $1 \frac{1}{6}$ b $14 \frac{1}{6}$ c $\frac{15}{16}$
 d $14 \frac{9}{20}$ e $3 \frac{7}{24}$ f $\frac{1}{12}$
 g $\frac{13}{18}$ h $3 \frac{31}{60}$ i $2 \frac{11}{15}$
 j $\frac{1}{15}$
 2 $3 \frac{1}{2} + 4 \frac{1}{4} = 7 \frac{3}{4}$ kg
 3 $9 \frac{1}{2} + 5 \frac{1}{4} + 4 = 18 \frac{3}{4}$ pounds
 4 $3 \frac{3}{4} - 2 \frac{1}{5} = 1 \frac{11}{20}$ kg
 5 $4 \frac{1}{2} - 1 \frac{1}{3} = 3 \frac{1}{6}$ hr
 6 a $\frac{1}{6} + \frac{1}{4} + \frac{1}{3} = \frac{3}{4}$ pizza b $3 - \frac{3}{4} = 2 \frac{1}{4}$ pizzas
 7 $15 - (4 \frac{1}{2} + 6 \frac{2}{5}) = 4 \frac{1}{10}$ km
 8 a $\frac{1}{8} + \frac{3}{8} + \frac{2}{8} + \frac{1}{8} + \frac{2}{8} = \frac{9}{8} = 1 \frac{1}{8}$ bags
 b $5 - 1 \frac{1}{8} = 3 \frac{7}{8}$ bags

Assessment on Lesson 4

- 1 a $1 \frac{1}{2}$ b $4 \frac{2}{15}$
 c $2 \frac{1}{8}$ d $1 \frac{1}{6}$
 2 a $4 \frac{1}{6}$ b $\frac{5}{8}$ c $3 \frac{7}{12}$
 3 a $15 \frac{1}{2} - (4 \frac{1}{2} + 5 \frac{1}{2}) = 5 \frac{1}{2}$ pounds
 b ① $\frac{1}{2} = \frac{8}{16}$ ② $\frac{7}{16}$

Assessment on Unit 1

First

- 1 6 2 0 or 6 3 even
4 1 5 prime 6 1
7 their product 8 $(6 \times 7) + (6 \times 5)$
9 $2 \times (8 + 3)$

Second

- 1 a 2 b 2 c 2 d 1
2 $(8 \times 2) + (8 \times 7)$ 3 $2\frac{3}{10}$
4 a $8\frac{5}{24}$ b $3\frac{13}{20}$
5 GCF = 5 $(5 \times 5) + (5 \times 3) = 5 \times (5 + 3)$
6 GCF = 8 , LCM = 48
7 $25 - 9\frac{1}{2} = 15\frac{1}{2}$ pounds

Exercises on

Unit 2

Lessons 1&2

- 1 a -12 b 40 c -10 d -50 e 5
f -20 g 16 h 3 i -3 j -150
2 a -1 b -6 c 7 d -8 e -3
f 3 g 4 h 0
3 Answer by yourself.
4 The previous : 9 , -8 , -1 , -6 , 8
The next : 11 , -6 , 1 , -4 , 10
5 a < b < c > d > e > f <
g > h < i > j = k = l <
6 a Ascending: -6 , -3 , 0 , 5 , 8
Descending: 8 , 5 , 0 , -3 , -6
b Ascending: -3 , -1 , 0 , 1 , 3
Descending: 3 , 1 , 0 , -1 , -3
7 a 9 b -3 c 12 d 0 e 1

f -1

- 8 a -15 b 25 c -4 d -1 e 12
f -10 g 1 h 1 i 0

j the same distance , opposite

- 9 a -4 b 0 c -15 d 12 e 0
f -6 g -1 h 0 i less than

j greater than

Assessment on Lessons 1&2

- 1 a -5 b -1 c -8
d < e 8 f 6
g -8 h 1
2 a -2 , -1 , 0 , 1 b -1 , 0 , 1 , 2
c -32 , -3 , 0 , 2 , 9 d Draw by yourself.

Lessons 3&4

- 1 Fraction form $\frac{a}{b}$: $\frac{5}{10}$, $-\frac{8}{10}$, $\frac{5}{1}$, $-\frac{7}{2}$, $\frac{11}{4}$
Additive inverse: -2.5 , 0.8 , -5 , $3\frac{1}{2}$, $-2\frac{3}{4}$
2 a belongs b does not belong
c does not belong d does not belong
e does not belong f belongs
g does not belong h does not belong
i belongs j belongs
3 a a subset b a subset
c not a subset d a subset
e not a subset f a subset
g not a subset h not a subset
4 a ✓ , ✓ , ✓ , ✓ , Counting
b X , X , X , ✓ , Rational
c X , ✓ , ✓ , ✓ , Natural
d X , X , ✓ , ✓ , Integers
e X , X , X , ✓ , Rational
f X , X , X , X , None
g ✓ , ✓ , ✓ , ✓ , Counting
h X , X , ✓ , ✓ , Integers
i X , X , X , ✓ , Rational
j X , X , X , ✓ , Rational
5 Draw by yourself.

- 6 a < b < c < d < e < f <
g < h > i > j = k > l <

- 7 a Ascending : -5.5 , $-1\frac{3}{5}$, $2\frac{2}{3}$, 3.7 , $7\frac{1}{4}$
Descending : $7\frac{1}{4}$, 3.7 , $2\frac{2}{3}$, $-1\frac{3}{5}$, -5.5

- b Ascending : -0.82 , $-\frac{1}{2}$, 0.25 , $\frac{1}{2}$, $\frac{2}{3}$
Descending : $\frac{2}{3}$, $\frac{1}{2}$, 0.25 , $-\frac{1}{2}$, -0.82

- 8 a rational number b even number
c natural number d $\frac{3}{4}$
e $-\frac{6}{1}$ f $-4\frac{2}{3}$
g 0.5 h >
i $-\frac{8}{4}$ j $\frac{3}{2}$

Assessment on Lessons 3&4

- 1 a $-4\frac{1}{2}$ b negative integer
c rational d 5 e $-2, -3$
f -5.9 g $-\frac{5}{2}$
2 a $-5, -6$ b integer, rational numbers
c $7.7, 7\frac{1}{2}, 7, -3\frac{1}{5}, -3.8$

Lessons 5&6

- 1 a 5 b 15 c 6 d 45 e $\frac{7}{9}$
f $7\frac{3}{5}$ g $\frac{3}{4}$ h $7\frac{2}{3}$ i 0.03 j 0.7
k 7.04 l 6.5
2 a < b > c = d = e = f >
g > h > i > j < k < l >
m = n < o > p <
3 a Ascending: $-17, -9, |-3|, 8, |12|$
Descending: $|12|, 8, |-3|, -9, -17$
b Ascending: $-\frac{3}{4}, -\frac{5}{8}, |0.25|, |-0.5|, 0.75$
Descending: $0.75, |-0.5|, |0.25|, -\frac{8}{5}, -\frac{3}{4}$
4 a 5 or -5 b 7 c 9 d -5 e -4
f 18 g Moscow, < h A i -7.2
5 a ① Wael, Tamer and Mohamed

② Tariq, Sameh and Fouad

③ Fouad

④ Tariq

b Fouad, Mohamed, Wael, Sameh, Tamer, Tariq

Assessment on Lessons 5&6

- 1 a 1.5 b 6 c 2.7 d 0
e farther number to.
2 a 5 or -5 b same c 0.7
d $0.75, |- \frac{1}{2}|, |0.25|, -\frac{1}{8}, -\frac{1}{4}$
e ① < ② > ③ < ④ <

Assessment on Unit 2

First

- 1 -8 2 0 3 0
4 rational number 5 natural number
6 $\frac{2}{3}$ 7 $-\frac{3}{10}$ 8 -3.4 9 0

Second

- 1 -7 2 -7, -8
3 integer, rational numbers
4 -1.5 5 a 8, -8 b 5.6
6 a < b < c = d <
7 $|0.8|, 0.55, |- \frac{1}{2}|, -\frac{1}{4}, -\frac{3}{5}$

Accumulative Assessment on Units 1&2

First

- 1 $-4\frac{2}{3}$ 2 35 3 -7
4 > 5 -5 6 0
7 -1.25 8 28 9 $1\frac{1}{6}$

Second

- 1 $2 \times (8 + 6)$ 2 a $7\frac{19}{24}$ 3 $2\frac{3}{4}$
4 a 12, 30 b 6 c 60
5 a 5 or -5 b 3
6 1 7 0

Exercises on Unit 3

Lessons 1&2

- 1 a $-3/a$, b $5/x$ c $-3/y$
 d $\frac{1}{5}/x$, y $e -\frac{2}{8}/m$ f $8/a$, b, c
 g $7/r$ h $5/x$, y, z i $6/n$
 j $\frac{3}{7}/k$, m k $23/a$, b l $\frac{1}{6}/y$, z
- 2 a Numerical b Numerical c Algebraic
 d Algebraic e Algebraic f Numerical
 g Numerical h Algebraic i Numerical
 j Algebraic
- 3 a $a/8/5$ b $a, b/7/3,4$
 c $x/15$, $2.5/6$ d $y/63/5$
 e $m, h/12$, $5/0.2/0.3$
 f $w/2$, 3, 0.2, 6
- 4 a 1 / none b 1 / none
 c 2 / $7x$, $3x$ d 2 / none
 e 4 / 15, 3 f $4/3b$, $5b$, $2b$
- 5 a $12-d$ b $x+3$ c $\frac{1}{5}w$ d $x+10$
- 6 a -3 b a c 3
 d 2 e $5y$, $2y$ f none
 g 9 h 5, 3 i $m-10$

Assessment on Lessons 1&2

- 1 a none b 5, 3 c $60-x$
 d 3 e $\frac{2}{3}$, 4
- 2 a x b 3 c 2
 d $6x$, $2x$ e 3.2
- 3 a 4 b $5x$, $6x$ c 5, 2, 6
 d 3

Lessons 3

- 1 a $36+z$ b $x-5$ c $a+9$
 d $3b$ e $7.5p$ f $y-14$
 g $h+6$ h $9 \div r$ i $a+3.5$
 j $\frac{1}{2}q+4$ k $2w-7$ l $2v-3$
 m $2(g+6)$ n $3(s-2)$ o $3a+5$
 p $x+7$ q $m+12$ r $x+3$
- 2 a 9 more than a b 6 less than b
 c f less than 7.5 d 12 multiplied by y
 e 8 divided by s f k divided by r
 g add 6 to 3 times x h 2 times x less than 7
 i half the sum of m and 3
 j 5 times the difference between 3 and c
- 3 a $\rightarrow 3$ b $\rightarrow 1$ c $\rightarrow 4$ d $\rightarrow 2$
- 4 a $x-5$ b $x+10$ c $2x-3$
 d $3y-2$ e $3(m+12)$ f $\frac{1}{2}(a-7)$
 g $x+5$ h x , +

Assessment on Lesson 3

- 1 a $(m+18) \div 3$ b $b+1$
 c $4s$ d $35-w$ e $x-120$
- 2 a the sum of 3 and the fifth of a
 b multiply m by 6 c $3b$
 d $y-3$ e $p \div 5$ f $15t$

Lesson 4

- 1 a 4 b 3 c 3 d 8
 e 2^4 f 6^3 g 7×7
 h $6 \times 6 \times 6 \times 6$ i 10×10
 j $1 \times 1 \times 1 \times 1 \times 1$ k $5 \times 5 \times 5$
 l 2×2
- 2 a 25 b 27 c 32 d 1
 e 1 f 1000 g 0 h 0
 i 1 j 1 k 1 l 1
- 3 a 34 b 14 c 12 d 25
 e 10 f 19 g 9 h 12
 i 22

- 4 a 18 b 3 c 24 d 5
e 10
- 5 a 22 b 7 c 20 d 9
e 3 f 3 g 2 h 3
i 215 j 2 k 9 l 74
- 6 a 32 b 5 c 3 d 76
e 4² f 6, 4 g 4
- 7 a base, power b 4² c 6³
d 7² e 4⁵ f 6, 4 g 4
h 4
- 8 a 4 × 4 b 1 c 1 d 2⁵
e 5³ f 0 g 1
h 3 × 3 × 3 × 3 i = j >
k 19 l 800 m 3³

Assessment on Lesson 4

- 1 a 3 × 3 b 1 c = d 425
e 2
- 2 a 0 b 1 c 3 d 5 e 8
- 3 a 30 b 9 c 9 d 16

Lessons 5-7

- 1 a 8x b 12y c 7z
d 50m + 15 e 6n + 3 f 300 - 9p
g 3q + 6
- 2 a 33 b 1 c 3.9 d 5
e 3 f 3
- 3 a 34 b 21 c 11 d 21
e 7 f 4 g 21 h 0
- 4 a 11 b 22 c 2 d 12
- 5 a 10 + 5h b 35 pounds
- 6 a 10p - 325 b 175 pounds
- 7 a Not equivalent b Equivalent

Assessment on Lessons 5-7

- 1 a 120m b 5d + 20 c 15 d 3
e putting the exponent in the simplest form, subtraction, multiplication, addition. f 4s
- 2 a 45 b 81 c not equal
d 12 e 1 5k + 6 f 2 26 hours

Assessment on Unit 3

First

- 1 - 3 2 3 3 2
4 2y - 3 5 25 - h 6 5³
7 = 8 15 b 9 first choice

Second

- 1 s - 10 2 3n, 2n
3 subtract 5 from 3 times x
4 6n 5 80
6 a 9n + 20 b ① 2 ② 9 ③ 20
7 not equivalent

Accumulative Assessment on Units 1-3

First

- 1 $\frac{3}{4}$ 2 x - 9 3 3.7
4 2³ 5 2⁴ 6 2
7 1 8 2 9 8x

Second

- 1 add 4 to 3 times b 2 a 34 b 2
3 $3\frac{3}{4} - 2\frac{1}{5} = 1\frac{11}{20}$ kg

Exercises on Unit 4

Lesson 1

- 1 a x + 2 = 12, x = 10
b x + 1 = 7, x = 6
c 3x = 12, x = 4
d 2x = 12, x = 6
e 5x = 10, x = 2
f x + 6 = 9, x = 3
g x + 9 = 12, x = 3
h 8x = 8, x = 1
- 2 a 3 b 5 c 2 d 14
e 4 f 7 g 12 h 20

Guide Answers

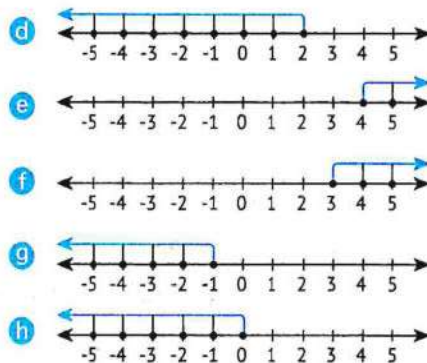
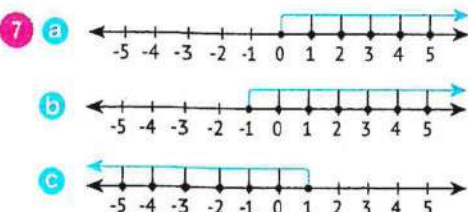
- 3 a 5 b 11 c 2 d 9
e 4 f 3 g 5 h 3

Assessment on Lesson 1

- 1 a 7 b 2 c 7 d 3
e 18
2 a $3x = 15$, $x = 5$ b $x + 1 = 5$, $x = 4$
3 a 5 b 11 c 7 d 175

Lessons 2&3

- 1 a 110 cm – 112 cm – 116 cm
b 100 cm – 120 cm – 130 cm
2 a 45,000 kg – 46,000 kg – 47,000 kg
b 23,000 kg – 24,000 kg – 24,500 kg
3 a $x > -1$ b $x < 2$ c $x > -9$
d $x < 2$ e $x \geq 6$ f $x \leq -8$
g $x < 0$ h $x > 0$ i $x \geq 0$
j $x > 0$ k $x \geq 0$ l $x \leq 0$
4 a greater than 9 b greater than -5
c less than 2 d less than -7
e less than or equal to -3
f less than or equal to 4
g greater than or equal to 3
h greater than or equal to 0
5 a, c, d, f, g, h
6 a 0, 1, 2 or any integer less than 3
b 1, 2, 3 or any integer greater than or equal 1
c 2, 1, 0 or any integer less than 3
d 3, 2, 1 or any integer less than 4
e 4, 3, 2 or any integer less than or equal 4
f 8, 7, 6 or any integer less than 9

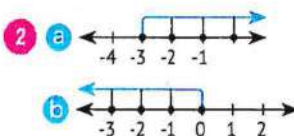


- 8 a $x > -1$ b $x < 5$ c $x \leq -7$
d $x > 3$ e $x < 0$ f $x \leq 0$
9 3 does not belong to the solution set on and of then
h each including all values to the left of 4
i -9.5 j 6 k $x \leq 7$
g a ① both of them include numbers to the left of -8 on the number line.
② -8 does not belong to the solution set of the inequality " $x < -8$ " and -8 belongs to the solution set of the inequality " $x \leq -8$ ".
b ① -8 belongs to the solution set of the inequality of any of them.
② $x \geq -8$ has all numbers to the right of -8 and $x \leq -8$ has all numbers to the left of -8.
c ① None.
② -8 is the solution of " $x = -8$ " and -8 does not belong to the solution set of the inequality " $x < -8$ ".

- 10 a $x < 3$ b $x > -2$ c $x < -1$
d $x > 2$ e $x > -6$ f $x < 5$

Assessment on Lessons 2&3

- 1 a $x > -5$ b less than c $x > 0$
d -3 e -2



- 3 a $x \leq 5$ or $x < 6$ b $x \geq 0$ or $x > -1$

Assessment on Unit 4

First

- 1 4
- 2 4
- 3 8
- 4 3 ...
- 5 $x > 4$
- 6 $x \leq -2$
- 7 $x < 0$
- 8 $x < 4$
- 9 the second graph

Second

- 1 a 2 b 5
- c 4 d 6
- 2 $3x = 15$ 3 $x < -6$
- 4 $x \geq 3$
- 5 a $x > 0$ b 9 belongs to both
- 6 a 9 b 6
- 7 a $x > 1$ or $x \geq -2$ b $x \leq -3$ or $x < -2$

Accumulative Assessment on Units 1-4

First

- 1 their product 2 -8 3 2
- 4 $x + 5$ 5 8
- 6 1 7 3 8 1

Second

- 1 $8 \times (9 + 2) = (8 \times 9) + (8 \times 2)$
- 2 $x < -6$
- 3 $(6 \times 2) + (6 \times 3) = 6 \times (2 + 3)$
- 4 a 12 b 8

Theme 2

Exercises on

Unit 5

Lessons 1&2

- 1 a Dependent, Independent
b Independent, Dependent
c Dependent, Independent
d Dependent, Independent
e Independent, Dependent
f Independent, Dependent
g Independent, Dependent
h Independent, Dependent
i Independent, Dependent
- 2 a Independent: r, s, z, x
Dependent: e, b, m, y
b Independent: a, t, p, m
Dependent: b, f, z, w
- 3 a $y = 9x$ b x c y d 54
- 4 a $y = x + 15$ b x c y d 135
- 5 a $y = x - 50$ b x c y d 370
- 6 a $y = x + 3$ b x c y d 140, 120, 90, 70, 60
- 7 a x b a
c ① the number of books ② the price of books
d ① the amount of flour
② the number of baked
e what Ahmed saves each month, what Ahmed saves in a full year.

Assessment on Lessons 1&2

- 1 a w b a

Guide Answers

- c distance traveled
d the number of correct answers.
- 2 a $y = 150x$ b x, y c 1800 pounds
3 a $y = 90x$ b x c y
d 3,150 pounds

Lesson 3

- 1 a add 4 b subtract 7
c $y = 5x$ d $y = x \div 7$
e multiply by 2, then add 3
f divide by 2, then add 4
g $y = (x + 7) \times 2$ h $y = (x + 6) + 3$
i $y = 5x - 2$ j $y = x + 4 - 3$
k subtract 2, then multiply by 4
l subtract 9, then divide by 2
- 2 a $x = 5$ R: subtract 5
eq: $y = x - 5$
b $x = 4$ R: multiply by 3
eq: $y = 3x$
c $x = 6$ R: multiply by 4
eq: $y = 4x$
d $x = 5$ R: multiply 5 then add 3
eq: $y = 5x + 3$
e $x = 9$ R: subtract 2 then multiply 3
eq: $y = (x - 2) \times 3$
f $x = 18$ R: Divide by 2 then subtract 3
eq: $y = x + 2 - 3$
g $x = 25$ R: subtract 1 then divide by 3
eq: $y = (x - 1) \div 3$
- 3 a $y = x + 3.1, y = 6$
b $y = 2x, 16$ c $y = \frac{1}{3}x, 5$
d $y = 8 - x, 4.5$
e add 5 then multiply by 3, 21
f subtract from 9 then multiply by 2, 12
- 4 a $y = 9 - x$ b $y = 2x + 5$
c $y = 3(x + 6)$ d divide by 3
e subtract 3 then divide by 2
f multiply by 5 then subtract 2
g 22 h 0 i $y = (x + 1) \times 2$

Assessment on Lesson 3

3

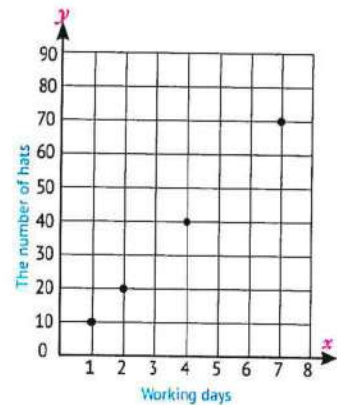
- 1 a $y = x + 4$ b multiply by 5
c 18 d $y = \frac{1}{2}x + 5$
- 2 a $y = (x + 4) \div 3, x, y, 3$
b $y = x \div 2 - 1, x, y, 3$
c subtract 5 then multiply by 2, $x, y, 4$
d multiply by 3 then add 4, $x, y, 4$
- 3 $x \rightarrow 6, 7, 1, 4$ $y \rightarrow 7, 13, 21, 9, 19$

Lesson 4

1

x	1	2	4	7
y	10	20	40	70
(x, y)	(1, 10)	(2, 20)	(4, 40)	(7, 70)

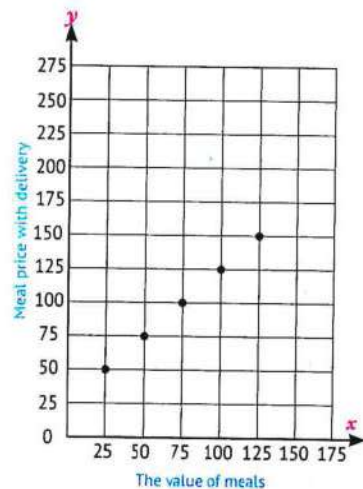
The equation $y = 10x$



2

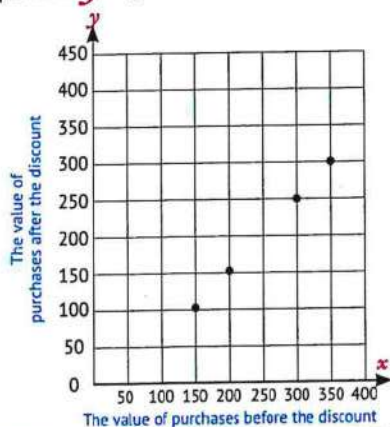
x	25	50	75	100	125
y	50	75	100	125	150

The equation $y = x + 25$



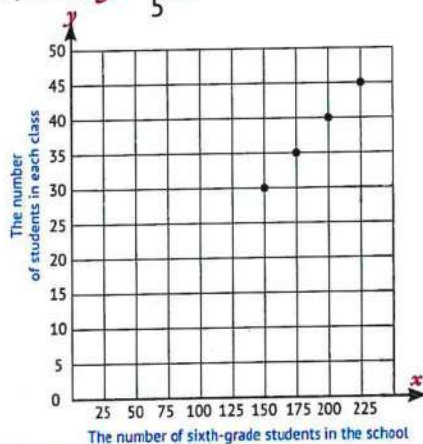
x	150	200	300	350
y	100	150	250	300
(x, y)	(150, 100)	(200, 150)	(300, 250)	(350, 300)

The equation $y = x - 50$



x	150	175	200	225
y	30	35	40	45

The equation $y = \frac{1}{5}x$

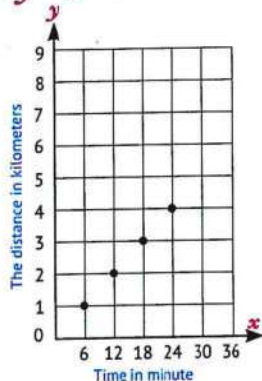


Assessment on Lesson

4

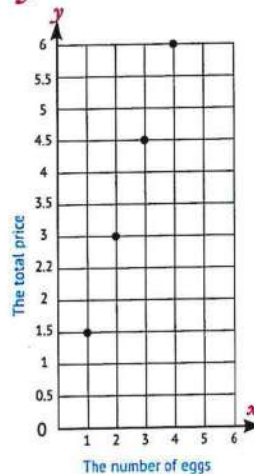
x	6	12	18	24
y	1	2	3	4
(x, y)	(6, 1)	(12, 2)	(18, 3)	(24, 4)

The equation $y = x \div 6$



x	1	2	3	4
y	1.5	3	4.5	6
(x, y)	(1, 1.5)	(2, 3)	(3, 4.5)	(4, 6)

The equation $y = 1.5x$



Assessment on Unit

5

First

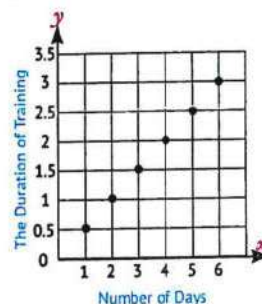
- 1 **b**
- 2 **r**
- 3 exam result
- 4 the number of days you go to the club
- 5 $y = 2(x + 5)$
- 6 subtract 8 then divide by 3
- 7 8
- 8 18
- 9 32

Second

- 1 **a**
- 2 **a** the size of garage
b the number of cars
- 3 **a** $y = x + 2.4$ **b** 6.4
- 4 **a** $y = x + 4$ **b** 4
- 5 **a** add 15 then divide by 4 **b** 5
- 6

x	1	2	3	4	5	6
y	0.5	1	1.5	2	2.5	3
(x, y)	(1, 0.5)	(2, 1)	(3, 1.5)	(4, 2)	(5, 2.5)	(6, 3)

The equation $y = 0.5x$



Guide Answers

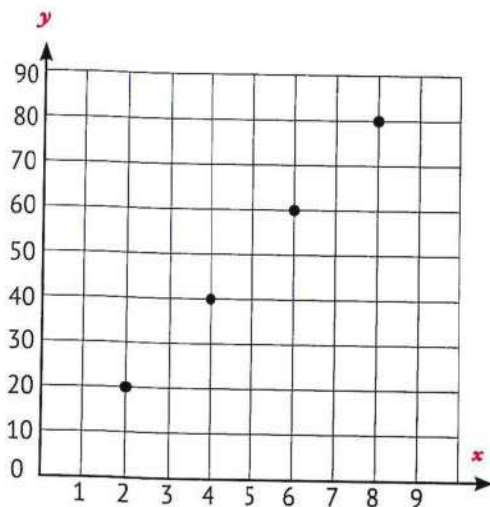
Accumulative Assessment on Units 1-5

First

- 1 15 2 -1 3 $(m + 18) \div 3$
4 $3 \times 3 \times 3 \times 3$ 5 3

Second

- 1 2, 3, 5, 7 2 9, 3, 6
3 -2, -1, 0, 1 4 same 5 12
6



- The equation is $y = 10x$

Exercises on Unit 6

Lesson 1

- 1 a None b Statistical c None
d None e None f None
g Statistical h None i Statistical
j Statistical
- 2 a Numerical b Categorical c Categorical
d Numerical e Numerical f Numerical
g Categorical h Numerical i Numerical
j Categorical
- 3 a Statistical, Non-statistical

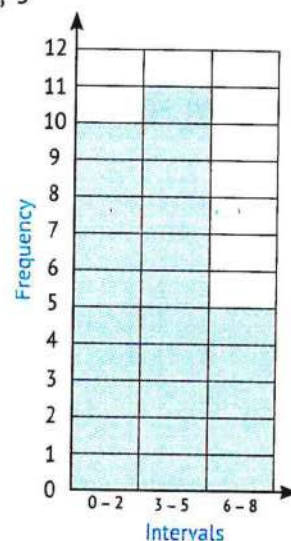
- b Numerical, Categorical c Numerical
d Categorical e Non-statistical, Statistical
f Non-statistical, Statistical
g Numerical h Numerical
i Categorical j Categorical/numerical
- 4 a results in a lot of different answers
b Favorite colors c favorite TV shows
d Ages e Salaries f weights
g heights h names i types of pets

Assessment on Lesson 1

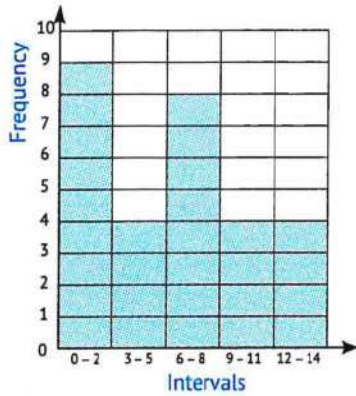
- 1 a numbers b words
c non statistical d statistical
e categorical
- 2 a Non-statistical b Categorical
c Non-statistical d Categorical
e Non-statistical f Numerical
g Numerical h Non-statistical

Lessons 2&3

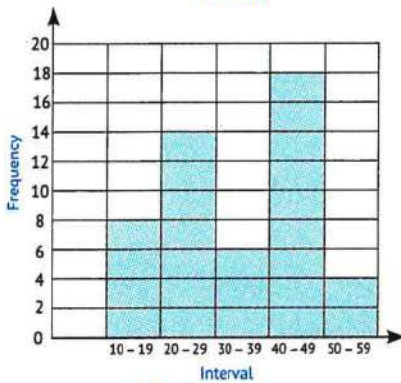
- 1 a bar graph b histogram c bar graph
d dot plots e histogram f histogram
g bar graph h dot plots i dot plots
j histogram k histogram
- 2 8, 14, 6, 18, 10
- 3 10, 11, 5



4 9, 4, 8, 4, 4



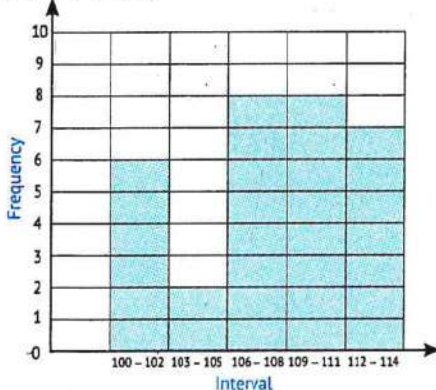
5



- 6 a histogram b dot plots
 c bar graph d all of the previous
 e each information is represent by a point
 f each bar represent a number or one categorical.
 g the bars must touch
 h bars are used to represent data
 i both of bar graph and histogram
 j all of the previous

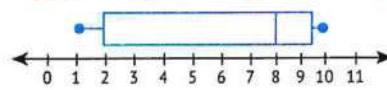
Assessment on Lessons 2&3

- 1 a histogram b bar graph
 c all of the previous
 d can display numerical and categorical data
 2 6, 2, 8, 8, 7

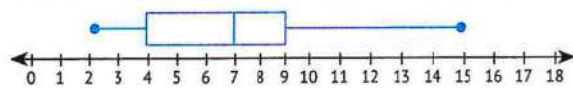


Lesson 4

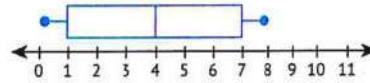
- 1 a the central tendency b 6
 c 6 d 3 e 6
 f 2, 7
 2 a ① 2 ② 4 ③ 10 ④ 15 ⑤ 18
 b ① 1 ② 3 ③ 12 ④ 14 ⑤ 16
 c ① 4 ② 5 ③ 7 ④ 13 ⑤ 15
 3 a The order: 1, 3, 8, 9, 10
 ① 1 ② 2 ③ 8 ④ 9.5 ⑤ 10



- b The order: 2, 4, 5, 7, 8, 9, 15
 ① 2 ② 4 ③ 7 ④ 9 ⑤ 15

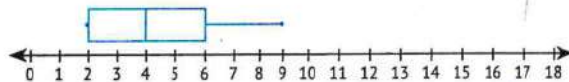


- c The order: 0, 1, 1, 2, 3, 4, 5, 6, 7, 8, 8
 ① 0 ② 1 ③ 4 ④ 7 ⑤ 8



Assessment on Lesson 4

- 1 a 8 b 4 c 1
 d 8 e 3, 8
 2 a 2 b 4 c 7
 d 9 e 10
 3 a 2 b 6 c 10
 d 13 e 16
 4 a 2 b 2 c 4
 d 6 e 9



Lesson 5

- 1 a Dot plot, box plot b Dot plot, box plot
 c Dot plot, box plot d Dot plot, box plot
 e Dot plot, box plots f dot plots, histogram
 g Dot plot h dot plots
 i dot plots j Dot plot, histogram
 k Dot plot, histogram l dot plots
 m dot plots n Dot plot, histogram

- 2 a ① 5, histogram ② 140, box plot
 ③ 0, box plot ④ 300, box plot
 ⑤ 4, histogram

b ①, ② answer by yourself

- 3 a ① 4, dot plots ② 152, both
 ③ 140, both ④ 159, both
 ⑤ 7, dot plots

b answer by yourself

- 4 histogram

- 5 a ② b ③ c ①

Assessment on Lesson 5

- 1 a ② b ③ c ①
 2 a 95, dot plots b 0, dot plots
 c 30, both d 8, both e 6, both

Assessment on Unit 6

First

- 1 It results in a lot of different answers
 2 favorite colors 3 ages 4 weight
 5 names 6 histogram 7 dot plot
 8 both bar graph and histogram
 9 8 10 8

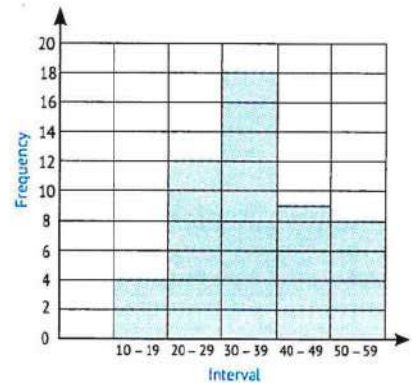
Second

- 1 statistical, non statistical
 2 numerical, categorical
 3 numerical 4 numerical 5 histogram

- 6 bar graph 7 7 8 1
 9 dot plot 10 histogram

Third

1



- 2 • order: 2, 2, 3, 7, 8, 9, 9, 10, 10, 12
 • Min: 2 • Max: 12 • Median: 8.5
 • Upper: 10 • Lower: 3, (Draw by your self)

- 3 a ① 3, dot plots ② 52, both
 ③ 40, both ④ 59, both
 ⑤ 9, dot plots

b • Dot plots

① How many students weight 50 kg?

② How many students weight less than 40 kg?

• Box plots

① What is the upper quartile?

② What is the lower quartile?

(there are many answers)

Accumulative Assessment on Units 1-6

First

- 1 1 2 0 3 rational
 4 3 5 $x \leq -7$

Second

- 1 6, 4 2 65 **b** 3 7
 4 $x > 0$ or $x \geq 1$ 5 $x > 1$ or $x \geq 2$

Third

- 1 a 2 b 10 c 6 d 8 e 3
 2 a 34 b 29

Exercises on Unit 7

Lessons 1&2

- 1 a 5 b 13 c 6 d 7
e 15 f 8 g 15 h 6
i 16 j 24
- 2 a 5 b 5.5 c 4 d 3
e 3 f 50
- 3 126 4 92 5 24 6 2
7 3
- 8 a 23.25 b 4 c 10 d 1
e 8 f 9 g 48
- 9 a 7 b 4 c 24 d 5
e 100 f 6

Assessment on Lessons 1&2

- 1 a 8 b 3.5 c 6
d 75 e 17
- 2 a 5 b 15
- 3 $6\frac{2}{5} = 6.4$ 4 41,000

Lesson 3

- 1 a 6 b 5,9 c none
d 9 e 12 f none
g 1 h none i 3,6
j none
- 2 a 28 b 2 c 200
d 4 e none f none
g 50, 51 h 219, 220 i none
j none
- 3 a stays the same b increases
c decreases d stays the same

Guide Answers

- e increases f decreases
- 4 a both b median c mean
d mean e both f mean
- 5 a 8, 9, 9 and 10, 1
b 14, 14, 11, none
c 9, 8.5, 7, 14
d 27, 27.5, 30, 20 and 21
- 6 a the most common value b 2
c 25 d more than e decreases
f affected g not affected h median
i mean

Assessment on Lesson 3

- 1 a 3 b pen c 6
d mean e mean
- 2 a two modes b decreases
c both mean and median
- 3 a 17 b 17 c 16
d 10

Lesson 4

- 1 a 32 b 34 c 5
d 7 e 58 f 7
g 51
- 2 a 11, 19, 8 b 2, 9, 7 c 10, 21, 11
d 21, 28, 7 e 11, 22, 11 f 31, 39, 8
- 3 a 20, 11, 9 b 10, 0, 10 c 21, 10, 11
d 30, 20, 10 e 23, 12, 11 f 38, 31, 7
- 4 a 18, 11, 7 b 200, 85, 115
c 1,200, 3,600, 2,400
d 215, 280, 65
- 5 a maximum value - minimum value
b box plots or dot plots
c histogram d 8 e 12
f 17 g 27 h affected
i largest and smallest values j spread

Guide Answers

Assessment on Lesson

4

- 1 a range b 6 c 21
 d largest and smallest value
 2 a 12 b 18 c range
 d histogram
 3 a 11 b 28 c 17
 d 21 e 21.5 f 18

Assessment on Unit

7

First

- 1 63 2 6 3 median
 4 histogram 5 range 6 decrease
 7 the mean 8 15
 9 3 10 7

Second

- 1 5 2 3,5 3 14
 4 18 5 mean, range
 6 a 24 b 24 c 24
 d 9 e 29
 7 a 25 b 25 c 25
 d 8 e 30

Accumulative Assessment on Units 1-7

First

- 1 1 2 $4\frac{1}{4}$
 3 -2, -3 4 $2(x+7)$
 5 Bar graph
 6 11 7 -5.9 8 x

Second

- 1 $x > -1$ 2 z, m
 3 a 21 b 10 c 14
 c 11
 4 a 10 b 2 c 6
 d 6 e 8